

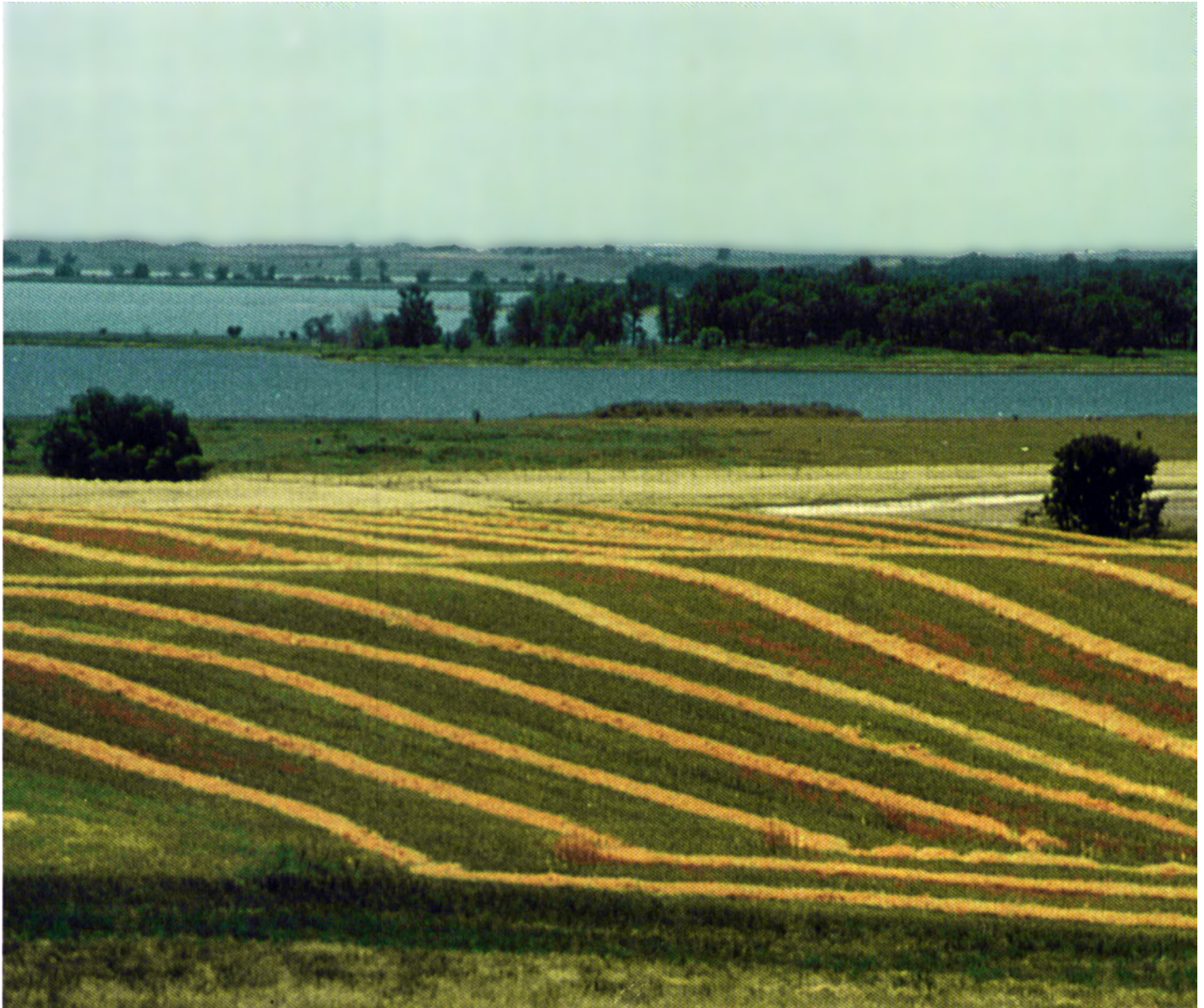


United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with
United States Department
of the Interior, Bureau of
Indian Affairs and Fish
and Wildlife Service, and
South Dakota Agricultural
Experiment Station

Soil Survey of Day County, South Dakota



How To Use This Soil Survey

General Soil Map

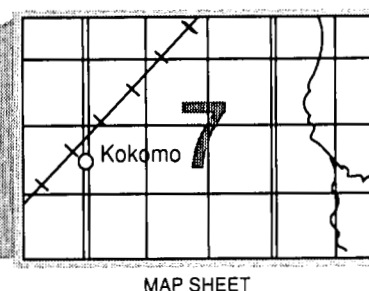
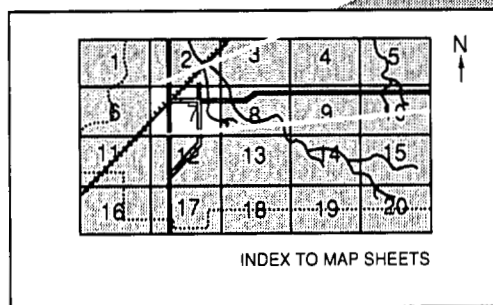
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

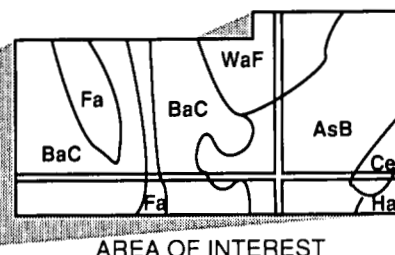
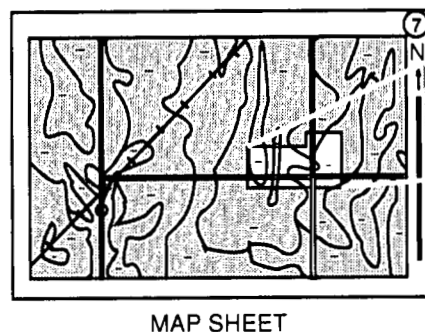
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1989. Soil names and descriptions were approved in 1990. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1990. This survey was made cooperatively by the Natural Resources Conservation Service, the United States Department of the Interior, Bureau of Indian Affairs and Fish and Wildlife Service, and the South Dakota Agricultural Experiment Station. It is part of the technical assistance furnished to the Day County Conservation District. Financial assistance was provided by the Day County Commissioners, the Bureau of Indian Affairs, the Fish and Wildlife Service, and the Day County Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: A typical area of Forman-Buse-Aastad loams, 1 to 6 percent slopes, in Day County. Waubay Lake is in the background.

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Foreword

This soil survey contains information that can be used in land-planning programs in Day County, South Dakota. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for optimum food and fiber production and for protection of our soil, water, air, plants, and animal resources. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the South Dakota Cooperative Extension Service.

Dean F. Fisher
State Conservationist
Natural Resources Conservation Service

Soil Survey of Day County, South Dakota

By Wayne J. Bachman, Natural Resources Conservation Service

Soils surveyed by Wayne J. Bachman, Daniel J. Brady, Kent E. Cooley, Kim D. Kempton, James B. Millar, and Loren D. Schultz, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service,
in cooperation with
the United States Department of the Interior, Bureau of Indian Affairs and Fish and Wildlife Service, and the South Dakota Agricultural Experiment Station

DAY COUNTY is in the northeastern part of South Dakota (fig. 1). It has a total area of 698,195 acres. About 12,000 acres is administered by the Bureau of Indian Affairs.

This soil survey updates an earlier survey of Day County (Klingelhoets and others, 1952). It provides additional information and has larger maps, which show the soils in greater detail.

General Nature of the County

This section provides some general information about Day County. It describes climate; physiography, relief, and drainage; settlement; farming; and natural resources.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Webster in the period 1952 to 1987. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 14 degrees F and the average daily minimum temperature is 4 degrees. The lowest temperature on record, which occurred at Webster on January 15, 1972, is -36 degrees. In summer, the average temperature is 69 degrees and the average daily maximum temperature is

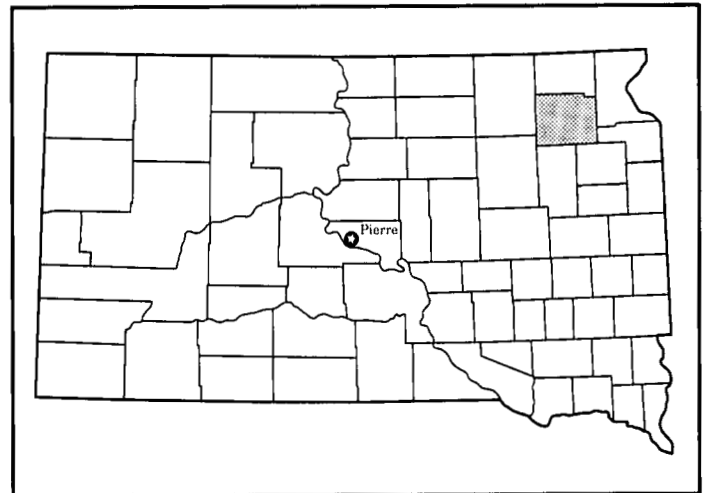


Figure 1.—Location of Day County in South Dakota.

82 degrees. The highest recorded temperature, which occurred at Webster on July 31, 1987, is 107 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 21 inches. Of this, 16 inches, or about 75 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 12 inches. The heaviest 1-day rainfall during the period of record was 3.50 inches at Webster on June 29, 1971.

Thunderstorms occur on about 36 days each year.

The average seasonal snowfall is 31 inches. The greatest snow depth at any one time during the period of record was 35 inches. On the average, 28 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 13 miles per hour, in spring.

Physiography, Relief, and Drainage

Day County is almost entirely on the Coteau des Prairies. The western one-sixth of the county lies in the James Basin. Also, the Ancient Lake Dakota bed is in the extreme northwest corner of the county (Leap, 1988).

The county is predominantly characterized by a rolling to gently undulating landscape with some flat areas that mark the position of former Pleistocene lakes. In the James Basin, the topography is gently undulating or nearly level. The rolling topography of the Prairie Coteau is characterized by numerous basins called "prairie potholes." These potholes are natural collecting areas for water. They reduce the extent of flooding of streams and rivers during spring runoff and periods of excessive precipitation.

On the Prairie Coteau, drainage is predominantly internal. Streams generally connect two or more potholes and flow primarily during spring runoff or after periods of heavy rainfall. On the eastern side of the county, a few streams drain eastward to the headwaters of the Big Sioux River (Leap, 1988). The western side of the county is drained by many small intermittent streams flowing down the western edge of the Prairie Coteau. The major streams in this area are Antelope, Mud, and Pickerel Creeks. The base level for streams flowing off the western edge of the Prairie Coteau is the James River (Leap, 1988).

Land elevation ranges from 1,300 feet above sea level in the extreme northwestern part of the county to 2,010 feet in the northeastern part.

Settlement

In 1873, the Dakota Legislature established Greely County, which consisted of the present-day counties of Day and Marshall, except for the six southern townships of Day County. In 1879, the Territorial Legislature changed the name from Greely to Day County in honor of Merrit H. Day, who was a distinguished member of the Legislature. The present boundary of Day County was established in 1885. Webster was named the county seat in November 1886 (Day County Historical Research Committee, 1981).

The first European settler in Day County was Francis Randell, a fur trader for the American Fur Company. Randell made his home on a peninsula on Rush Lake in 1850. Prior to 1880, early settlers made their claims in the lake region of northern Day County because of the timber that was available in this area. Settlement increased rapidly after the extension of railroads into the county beginning in 1881 (Day County Historical Research Committee, 1981).

According to the 1880 census, the population of Day County was 97. The population had increased to 9,168 by 1890. In 1950, the population was 12,558, but it had decreased to 8,133 by 1980. In 1980, the population of Webster, the largest community in the county, was 2,417 (U.S. Department of Commerce, 1982). Other towns and settlements in the county include Andover, Bristol, Butler, Enemy Swim, Grenville, Holmquist, Lily, Pierpont, Roslyn, and Waubay.

Railroads have served the county since 1881. The main highways are South Dakota Highway 25, which runs north and south, and U.S. Highway 12, which runs east and west. Most rural areas are served by all-weather roads and a network of secondary roads. A small airport is located at Webster.

Farming

Farming is the principal enterprise in Day County. About 61 percent of the farm income is derived from the sale of livestock and livestock products (U.S. Department of Commerce, 1987). The rest is derived mainly from the sale of small grain and corn. Some of the crops are used as feed for livestock.

In 1987, Day County had 778 farms. The average farm size was 734 acres (U.S. Department of Commerce, 1987). The general trend is toward fewer and larger farms.

Approximately 62 percent of the total acreage in the county is used for cultivated crops (U.S. Department of Commerce, 1987). Dryland farming is dominant, but 2,557 acres was irrigated in 1987 (U.S. Department of Commerce, 1987). Nearly all irrigation is by sprinkler irrigation systems. Alfalfa hay, wheat, oats, corn,

barley, and soybeans are the main crops.

Natural Resources

Soil is the most important resource in Day County. It provides a growing medium for crops and for grasses used for grazing by livestock. Other natural resources are water, sand and gravel, and wildlife.

The principal source of water for domestic use and for livestock is shallow wells. Recent construction of the WEB pipeline is now bringing water from the Missouri River to Day County for domestic use. Excavated ponds in areas of Dovray, Lamoure, Ludden, Oldham, Parnell, Southam, and Tonka soils provide additional water for livestock and wildlife. Deep wells are an additional source of water. The quantity of water in the deep wells is generally greater but of poorer quality than that provided by other sources (Leap, 1988).

Significant deposits of sand and gravel are in areas of the Renshaw-Fordville and Sioux-Renshaw associations, which are described under the heading "General Soil Map Units." Deposits of sand and gravel are also in scattered areas throughout the county, except in the Ancient Lake Dakota bed. Most of the sand and gravel deposits are unsuitable for concrete or construction material because of an excessive amount of shale (Leap, 1988). All of the sand and gravel can be used as subgrade material for roads and as bituminous aggregate.

Day County has many lakes, wetlands, and game production areas and thus provides excellent habitat for fish and wildlife and many recreational opportunities. In 1988, the county had 16,162 acres of State Game and Federal Waterfowl Production Areas and 4,694 acres in the Waubay National Wildlife Refuge. Deer, cottontail rabbits, fox, coyote, ducks, geese, and ring-necked pheasants are the major wildlife species. Walleye, northern pike, perch, bass, and other fish inhabit most of the permanent bodies of water. Pickerel Lake, Enemy Swim Lake, Blue Dog Lake, Minnewasta Lake, and Amsden Dam provide excellent fishing, boating, and camping opportunities.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; and the kinds of crops and native plants growing on the soils. They dug many holes to study the soil profile, which is the

sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of

the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Some of the names on the soil maps of this survey area do not fully agree with those on the maps of adjacent survey areas that were published at an earlier date. Differences are the result of variations in the design and composition of map units or of changes and refinements in series concepts.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for

the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils. They generally are in areas less than 4 acres in size.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soils occur in different landform positions (fig. 2). These different landform positions affect such characteristics as the amount of topsoil, the drainage class, the runoff rate, and the content of organic matter.

Soil Descriptions

Level to Moderately Sloping, Silty and Clayey Soils on Glacial Lake Plains and Flood Plains

These soils formed in lacustrine deposits and alluvium. They are dominantly level to moderately sloping, but they are strongly sloping along some drainageways. They make up about 2 percent of the county. About 80 percent of the acreage is cropland. Wheat, corn, oats, barley, and alfalfa are the main crops. Controlling erosion and conserving moisture are the main management concerns.

1. Great Bend-Beotia Association

Well drained, level to moderately sloping, silty soils on glacial lake plains

This association is characterized by flat areas and slight rises interrupted by a few drainage channels.

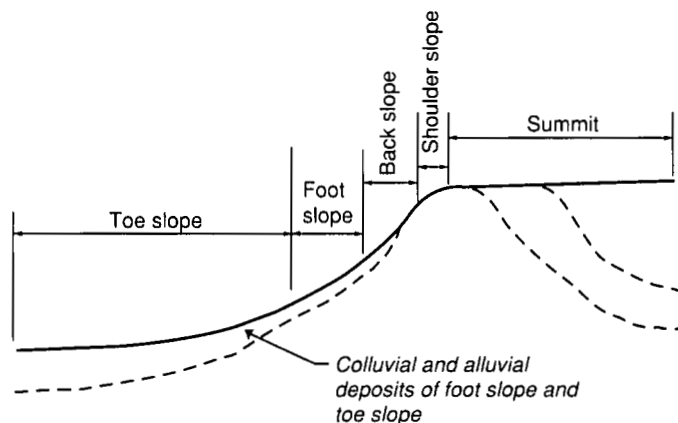


Figure 2.—Landform positions.

This association makes up less than 1 percent of the county. It is about 38 percent Great Bend soils, 27 percent Beotia soils, and 35 percent minor soils.

Great Bend soils are on summits and back slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is dark gray silt loam. The subsoil is grayish brown, pale brown, and pale yellow silt loam. It is calcareous in the lower part. The underlying material is light gray and light brownish gray, varved, calcareous silt loam and very fine sandy loam.

Beotia soils are on foot slopes. Slopes range from 0 to 3 percent. Typically, the surface soil is dark gray silt loam. The subsoil is grayish brown silt loam in the upper part. It is light brownish gray, calcareous silt loam in the lower part. The underlying material is light brownish gray and light gray, calcareous silt loam and silty clay loam. It is varved in the lower part.

Minor in this association are Aberdeen, Harmony, Huffton, Putney, Tonka, and Zell soils. The moderately well drained Aberdeen and Harmony soils contain more clay in the subsoil than the major soils. Aberdeen soils are on foot slopes, and Harmony soils are on summits and back slopes. The well drained Huffton and Zell soils are on shoulder slopes. They have carbonates at the

surface. Also, Huffton soils have accumulations of salt near the surface. Putney soils have more salts within a depth of 20 inches than the major soils. They are on back slopes. The poorly drained Tonka soils are in basins.

About 90 percent of this association is cropland. Corn, wheat, oats, and alfalfa are the main crops. Measures that control erosion and conserve moisture are the main management concerns. The soils in this association are suited to cultivated crops, tame pasture and hay, and range.

2. Ludden Association

Poorly drained and very poorly drained, level, clayey soils on flood plains

This association is characterized by broad flats dissected by shallow drainageways. It is frequently flooded for brief or long periods during snowmelt and after heavy rains. The drainage pattern is poorly defined and characterized by shallow drainageways.

This association makes up less than 1 percent of the county. It is about 80 percent Ludden soils and 20 percent minor soils.

Ludden soils are on low flood plains. Slopes are less than 1 percent. Typically, the surface layer is dark gray silty clay. The subsoil is dark gray and gray, calcareous silty clay. The underlying material is light olive gray, mottled, calcareous silty clay.

Minor in this association are Dovray, Lamoure, and Ranslo soils. Dovray soils have carbonates deeper in the profile than the major soils. They are on toe slopes. Lamoure soils contain less clay than the major soils. They are on low flood plains. Ranslo soils have a sodium-affected subsoil. They are on low flood plains.

About 60 percent of this association is cropland. Wheat, barley, and alfalfa are the main crops. Some areas support native grass and are used for grazing or hay. Controlling wetness is the main concern affecting the management of the major soils for crops. Improving tilth and increasing the rate of water infiltration are also concerns. The soils in this association are suited to cultivated crops, tame pasture and hay, and range, but the flooding is a limitation.

3. Harmony-Aberdeen-Nahon Association

Moderately well drained, level and nearly level, silty soils and level and nearly level, sodium-affected, silty soils on glacial lake plains

This association is characterized by broad flat areas and many microbasins.

This association makes up about 2 percent of the county. It is about 35 percent Harmony soils, 25 percent

Aberdeen soils, 20 percent Nahon soils, and 20 percent minor soils (fig. 3).

Harmony soils are on summits and back slopes. Slopes range from 0 to 2 percent. Typically, the surface soil is dark gray silt loam. The subsoil is dark gray and grayish brown silty clay in the upper part. It is light brownish gray, calcareous silty clay loam in the lower part. The underlying material is light brownish gray and light gray, calcareous silty clay loam and silt loam.

Aberdeen soils are on summits, back slopes, and foot slopes. Slopes range from 0 to 2 percent. Typically, the surface soil is dark gray silt loam. Below this is a transitional layer of dark gray and gray silt loam. The subsoil is dark gray and grayish brown silty clay in the upper part. It is light brownish gray, calcareous silty clay in the lower part. The underlying material is light gray, calcareous silty clay loam. It is varved in the lower part.

Nahon soils are on back slopes and foot slopes. Slopes range from 0 to 2 percent. Typically, the surface layer is dark gray silt loam. The subsurface layer is gray silt loam. The upper part of the subsoil is dark gray and light brownish gray silty clay. The lower part is light brownish gray, calcareous silty clay loam. It has nests of salt. The underlying material is light gray, white, and pale yellow, calcareous silty clay loam.

Minor in this association are Beotia, Exline, Great Bend, Huffton, Putney, Tonka, and Zell soils. Beotia soils contain more silt and less clay than the major soils. They are on foot slopes. The somewhat poorly drained Exline soils have salts within a depth of 16 inches. They are on foot slopes. The well drained Great Bend, Huffton, Putney, and Zell soils contain more silt and less clay than the major soils. Huffton and Zell soils also have carbonates at the surface. Great Bend and Putney soils are on back slopes. Huffton and Zell soils are on shoulder slopes. The poorly drained Tonka soils are in basins.

About 80 percent of this association is cropland. Corn, wheat, oats, barley, and alfalfa are the main crops. Conserving moisture, increasing the water infiltration rate, and improving tilth are the main management concerns. The soils in this association are suited to cultivated crops, tame pasture and hay, and range. The sodium-affected subsoil in the Aberdeen and Nahon soils is a limitation.

Level to Gently Sloping, Clayey Soils on Ice-Walled Lake Plains

These soils formed in clayey glaciolacustrine deposits on ice-walled lake plains. They make up about 2 percent of the county. About 85 percent of the acreage is cropland. Corn, wheat, oats, barley, and alfalfa are the main crops. Controlling erosion and

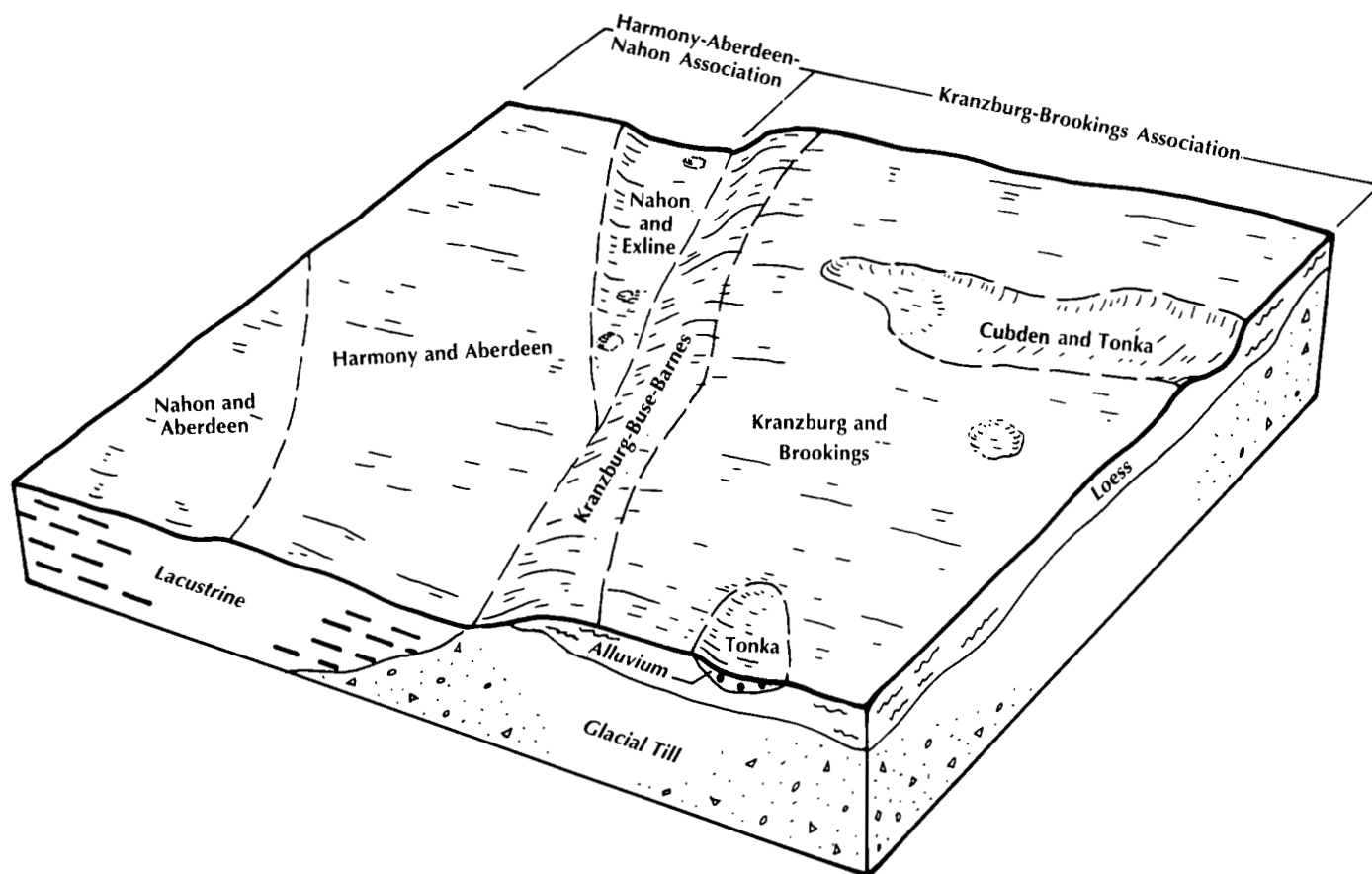


Figure 3.—Typical pattern of soils and underlying material in the Harmony-Aberdeen-Nahon and Kranzburg-Brookings associations.

improving tilth are the main management concerns.

4. Nutley-Sinai Association

Well drained, level to gently sloping, clayey soils on ice-walled lake plains

This association is characterized by flat areas and slight rises. Slopes are long and smooth. The drainage pattern is poorly defined in most areas.

This association makes up about 2 percent of the county. It is about 45 percent Nutley soils, 30 percent Sinai soils, and 25 percent minor soils (fig. 4).

Nutley soils are on summits and shoulder slopes. Slopes range from 0 to 6 percent. Typically, the surface layer is dark gray, calcareous silty clay. The subsoil is light brownish gray, calcareous clay. The underlying material is pale yellow, mottled, calcareous clay.

Sinai soils are on back slopes. Slopes range from 0 to 6 percent. Typically, the surface soil is very dark gray silty clay. The subsoil is dark gray silty clay in the upper

part. It is light brownish gray and light gray, calcareous silty clay in the lower part. The underlying material is light brownish gray, mottled, calcareous silty clay.

Minor in this association are Buse, Cubden, Forman, Oldham, Parnell, Poinsett, and Waubay soils. Buse and Forman soils contain more sand and less clay than the major soils. Buse soils are on shoulder slopes. Forman soils are on back slopes. Cubden soils have carbonates at the surface. They are on foot slopes. The poorly drained Oldham and very poorly drained Parnell soils are in basins. Poinsett and Waubay soils have less clay and more silt than the major soils. Poinsett soils are on back slopes, and Waubay soils are on foot slopes.

About 85 percent of this association is cropland. Wheat, oats, barley, corn, and alfalfa are the main crops. Measures that control erosion and improve tilth are the main management concerns. The soils in this association are suited to cultivated crops, tame pasture and hay, and range.

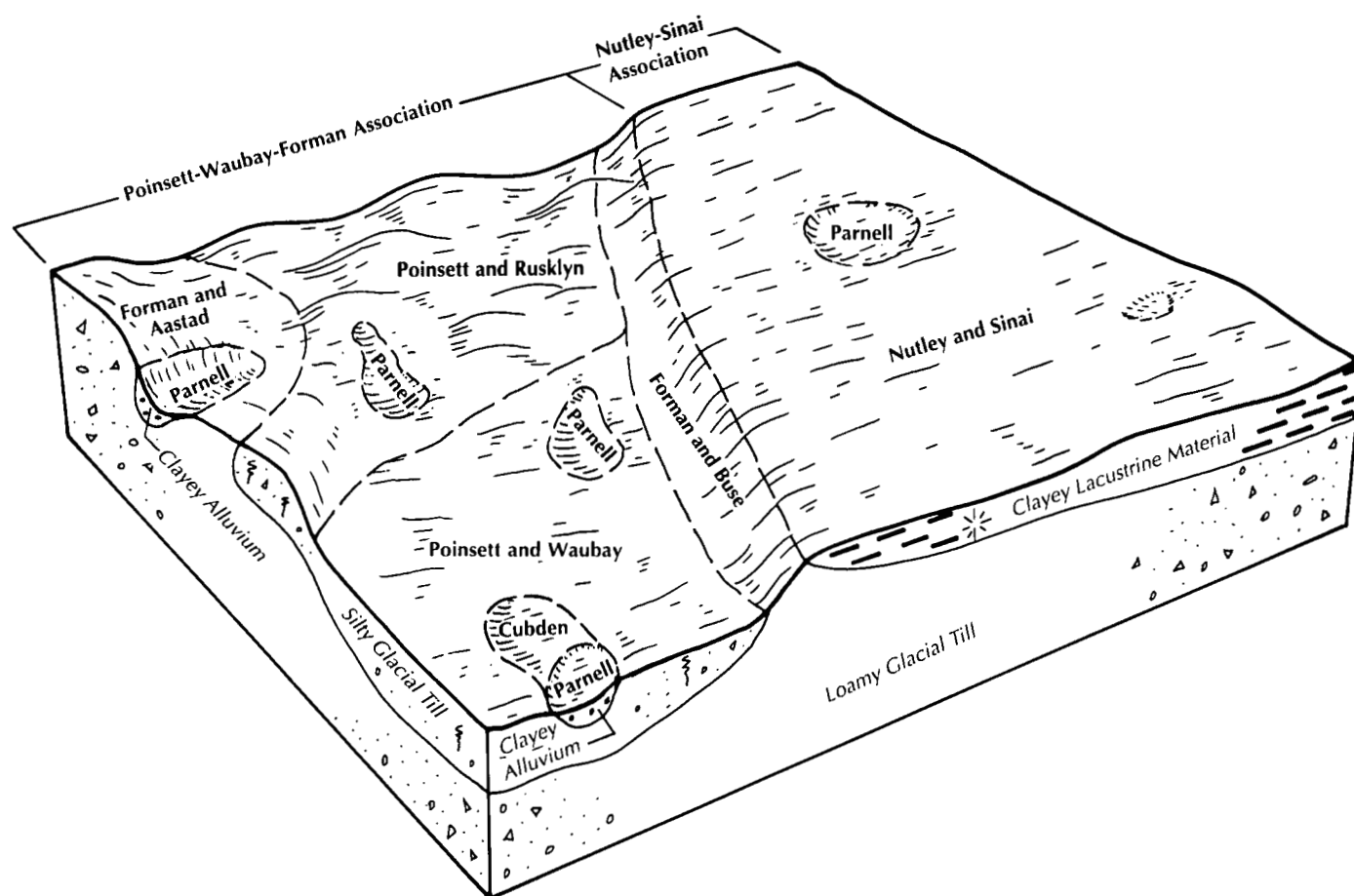


Figure 4.—Typical pattern of soils and underlying material in the Nutley-Sinai and Poinsett-Waubay-Forman associations.

Level to Steep, Loamy and Silty Soils on Till Plains and Moraines

These soils formed in glacial till. They are dominantly nearly level to steep, but they are level in basins. They make up about 58 percent of the county. About 60 percent of the acreage is cropland. Wheat, oats, barley, corn, soybeans, and alfalfa are the main crops. Areas of nearly level to moderately sloping soils are cultivated. The rolling to steep soils support native grass and are used for pasture and hay. Most of the soils in basins support native vegetation and are used for wildlife habitat or grazing. Controlling erosion and conserving moisture are the main management concerns.

5. Forman-Buse-Parnell Association

Well drained and very poorly drained, level to gently rolling, loamy and silty soils on till plains and moraines

This association is characterized by rises interrupted by narrow swales and many basins. Slopes generally

are short. Most areas are undulating, but some areas are level and others are gently rolling to hilly. The drainage pattern is poorly defined in most areas. Most drainageways terminate in large basins.

This association makes up about 51 percent of the county. It is about 35 percent Forman soils, 25 percent Buse soils, 20 percent Parnell soils, and 20 percent minor soils (fig. 5).

The well drained Forman soils are on summits and back slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is very dark gray loam. The subsoil is brown clay loam in the upper part. It is light brownish gray, calcareous clay loam in the lower part. The underlying material is light yellowish brown, calcareous clay loam.

The well drained Buse soils are on shoulder slopes. Slopes range from 3 to 9 percent. Typically, the surface layer is dark grayish brown, calcareous loam. The subsoil is light yellowish brown, calcareous clay loam. The underlying material also is light yellowish

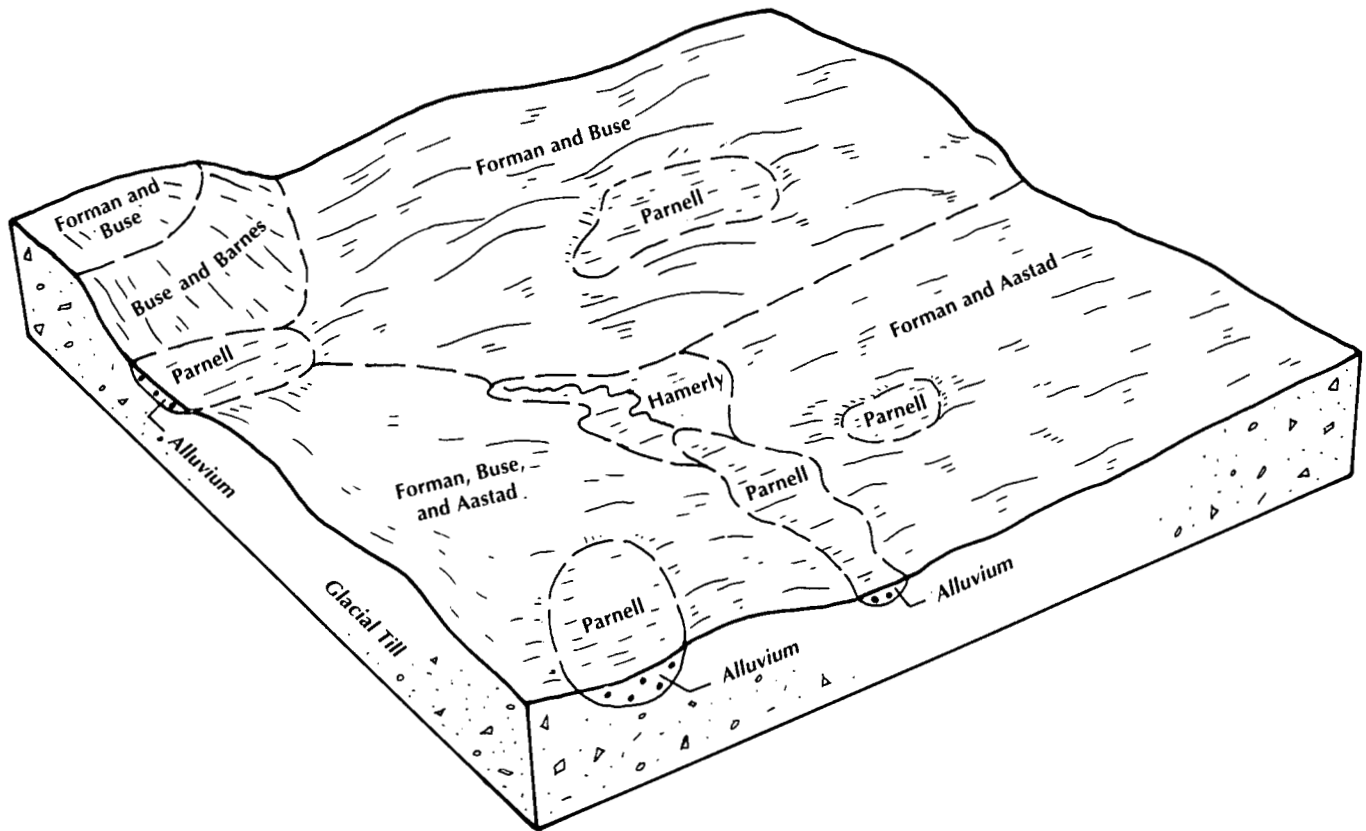


Figure 5.—Typical pattern of soils and underlying material in the Forman-Buse-Parnell association.

brown, calcareous clay loam.

The very poorly drained Parnell soils are in basins. Slopes are less than 1 percent. Typically, the surface soil is dark gray silty clay loam. The subsoil is dark gray silty clay. The underlying material is dark gray and light gray, calcareous clay and clay loam. It is mottled in the lower part.

Minor in this association are Aastad, Barnes, Fordville, Hamerly, Poinsett, Renshaw, Southam, Vallery, and Waubay soils. The moderately well drained Aastad and Waubay soils are on foot slopes. The well drained Barnes soils do not have an accumulation of clay in the subsoil. They are on back slopes. Fordville and Renshaw soils are on outwash plains. They are underlain by sand and gravel. The somewhat poorly drained Hamerly and poorly drained Vallery soils are around the edges of basins. They are calcareous to the surface. The well drained Poinsett soils have more silt and less sand than the major soils. They are on back slopes. The very poorly drained Southam soils are in basins.

About 65 percent of this association is cropland. Wheat, corn, barley, soybeans, oats, and alfalfa are the

main crops. Measures that conserve moisture and control erosion on the Forman and Barnes soils are the main management concerns. The Forman and Buse soils are suited to cultivated crops, tame pasture and hay, and range. The Parnell soils are suited to wetland wildlife habitat.

6. Buse-Barnes Association

Well drained, rolling to steep, loamy soils on moraines

This association is characterized by hills interrupted by narrow swales and drainageways. Slopes generally are short. Most areas are rolling to hilly, but some areas along the terminal moraine are steep. The drainage pattern is poorly defined. Most drainageways terminate in basins. Scattered stones are on the surface in some areas.

This association makes up about 5 percent of the county. It is about 40 percent Buse soils, 35 percent Barnes soils, and 25 percent minor soils.

Buse soils are on shoulder slopes. Slopes range from 9 to 40 percent. Typically, the surface layer is dark grayish brown, calcareous loam. The subsoil is light

yellowish brown, calcareous clay loam. The underlying material is light yellowish brown, calcareous clay loam.

Barnes soils are on back slopes. Slopes range from 9 to 25 percent. Typically, the surface layer is very dark gray loam. The subsoil is dark grayish brown loam in the upper part. It is light brownish gray, calcareous clay loam in the lower part. The underlying material is light yellowish brown, calcareous clay loam.

Minor in this association are Aastad, Forman, Langhei, Oldham, Parnell, Renshaw, Sioux, and Southam soils. The moderately well drained Aastad soils are on foot slopes. Forman soils have an increase in clay content in the subsoil. They are on back slopes. The well drained Langhei soils do not have a dark surface layer. They are on shoulder slopes. The poorly drained Oldham soils and the very poorly drained Parnell and Southam soils are in basins. The somewhat excessively drained Renshaw soils are on back slopes, and the excessively drained Sioux soils are on shoulder slopes. They are underlain by sand and gravel.

About 80 percent of this association supports native grasses and is used for grazing. Maintaining the most productive grasses and controlling erosion are the main concerns affecting range management. A few of the less sloping areas are cultivated. Wheat, oats, barley, and alfalfa are the main crops. Controlling erosion and conserving moisture are the main concerns in cultivated areas. The soils in this association are suited to range. In addition, less sloping areas of the Barnes soils are suited to cultivated crops and to tame pasture and hay.

7. Forman-Aastad-Cavour Association

Well drained and moderately well drained, level to gently rolling, loamy soils and moderately well drained, level and nearly level, sodium-affected, loamy soils; on till plains and moraines

This association is characterized by rises interrupted by shallow drainageways. Slopes are long and nearly level in some areas and short and gently rolling in other areas. The drainage pattern is well defined. Drainageways lead to the west to the glacial lake plain.

This association makes up about 2 percent of the county. It is about 30 percent Forman soils, 25 percent Aastad soils, 20 percent Cavour soils, and 25 percent minor soils.

The well drained Forman soils are on summits and back slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is very dark gray loam. The subsoil is brown clay loam in the upper part. It is light brownish gray, calcareous clay loam in the lower part. The underlying material is light yellowish brown, calcareous clay loam.

The moderately well drained Aastad soils are on foot

slopes. Slopes range from 0 to 6 percent. Typically, the surface soil is very dark gray loam. The subsoil is dark grayish brown and light olive brown clay loam in the upper part. It is light yellowish brown, mottled, calcareous clay loam in the lower part. The underlying material is olive yellow, mottled, calcareous clay loam.

The moderately well drained, sodium-affected Cavour soils are on back slopes. Slopes range from 0 to 2 percent. Typically, the surface layer is dark gray loam. The subsurface layer is dark gray and gray loam. The upper part of the subsoil is dark gray and grayish brown clay loam. The lower part is light brownish gray, calcareous clay loam that has nests of salt. The underlying material is light brownish gray and pale yellow, calcareous clay loam. It is mottled in the lower part.

Minor in this association are Buse, Ferney, Fordville, Hamerly, Harriet, La Prairie, Renshaw, and Vallers soils. Buse soils have carbonates at the surface. They are on shoulder slopes. Ferney soils have a sodium-affected subsoil. They are on foot slopes. Fordville and Renshaw soils are on back slopes. They are underlain by sand and gravel. The somewhat poorly drained Hamerly and poorly drained Vallers soils are on the edges of basins. They are calcareous at the surface. The poorly drained Harriet and moderately well drained La Prairie soils formed in alluvial deposits along streams and drainageways.

About 70 percent of this association is cropland. Wheat, oats, barley, corn, and alfalfa are the main crops. Measures that conserve moisture and control erosion are the main management concerns. Increasing the rate of water infiltration and improving tilth are also management concerns on the Cavour soils. The soils in this association are suited to cultivated crops, tame pasture and hay, and range. The sodium-affected subsoil in the Cavour soils is a limitation.

Level to Gently Rolling, Silty and Loamy Soils on Till Plains and Moraines

These soils formed mainly in silty material over loamy glacial till. They are generally level to gently rolling, but they are strongly sloping along some drainageways. They make up about 23 percent of the county. About 85 percent of the acreage is cropland. Corn, wheat, oats, barley, and alfalfa are the main crops.

8. Kranzburg-Brookings Association

Well drained and moderately well drained, level to gently sloping, silty soils on till plains

This association is on silty mantled till plains characterized by flat areas and slight rises. Slopes are

long and smooth. The drainage pattern is well defined. Drainageways lead to the west to the glacial lake plain.

This association makes up about 11 percent of the county. It is about 40 percent Kranzburg soils, 35 percent Brookings soils, and 25 percent minor soils (fig. 3).

The well drained Kranzburg soils are on summits and back slopes. Slopes range from 0 to 6 percent. Typically, the surface layer is very dark gray silt loam. The subsoil is dark grayish brown and brown silt loam in the upper part. It is pale brown, calcareous clay loam in the lower part. The underlying material is light yellowish brown, calcareous clay loam.

The moderately well drained Brookings soils are on foot slopes. Slopes range from 0 to 2 percent. Typically, the surface soil is dark gray silt loam. The subsoil is dark grayish brown and brown silt loam in the upper part. It is light gray, calcareous clay loam in the lower part. The underlying material is light yellowish brown, mottled, calcareous clay loam.

Minor in this association are Aastad, Barnes, Buse, Cubden, La Prairie, and Tonka soils. Aastad, Barnes, and Buse soils contain more sand and less silt in the subsoil than the major soils. Aastad soils are on foot slopes. Barnes soils are on back slopes, and Buse soils are on shoulder slopes. The somewhat poorly drained Cubden soils have carbonates at the surface. They are on foot slopes. The moderately well drained La Prairie soils formed in alluvial deposits along streams and drainageways. The poorly drained Tonka soils are in basins.

About 85 percent of this association is cropland. Corn, wheat, oats, barley, soybeans, and alfalfa are the main crops. Areas of steeper soils along drainageways support native grass and are used for grazing. Measures that control erosion and conserve moisture are the main management needs. The soils in this association are suited to cultivated crops, tame pasture and hay, and range.

9. Poinsett-Waubay-Forman Association

Well drained and moderately well drained, level to gently rolling, silty and loamy soils on till plains and moraines

This association is characterized by smooth slopes and scattered basins. Slopes generally are short. Most areas are gently sloping to gently rolling, but some areas are level. The drainage pattern is poorly defined. Most drainageways terminate in basins.

This association makes up about 12 percent of the county. It is about 30 percent Poinsett soils, 25 percent Waubay soils, 20 percent Forman soils, and 25 percent minor soils (fig. 4).

The well drained Poinsett soils are on summits and back slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is very dark gray silty clay loam. The subsoil is dark gray and dark yellowish brown silty clay loam in the upper part. It is light yellowish brown, calcareous silty clay loam in the lower part. The underlying material is light yellowish brown, calcareous silty clay loam.

The moderately well drained Waubay soils are on foot slopes. Slopes range from 0 to 2 percent. Typically, the surface soil is very dark gray silty clay loam. The subsoil is very dark grayish brown and dark grayish brown silty clay loam in the upper part. It is light yellowish brown, calcareous silty clay loam in the lower part. The underlying material also is light yellowish brown, calcareous silty clay loam.

The well drained Forman soils are on back slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is very dark gray loam. The subsoil is brown clay loam in the upper part. It is light brownish gray, calcareous clay loam in the lower part. The underlying material is light yellowish brown, calcareous clay loam.

Minor in this association are Aastad, Buse, Colvin, Cubden, Oldham, Parnell, Rusklyn, and Southam soils. Aastad soils contain more sand and less silt than the major soils. They are on foot slopes. Buse and Rusklyn soils are on shoulder slopes. They are calcareous to the surface. The poorly drained Colvin and somewhat poorly drained Cubden soils are around the edges of basins. The poorly drained Oldham soils and the very poorly drained Parnell and Southam soils are in basins.

About 85 percent of this association is cropland. Wheat, corn, oats, barley, soybeans, and alfalfa are the main crops. Measures that conserve moisture and control erosion are the main management concerns. The soils in this association are suited to cultivated crops, tame pasture and hay, and range.

10. Vienna Association

Well drained, level to gently sloping, silty soils on till plains

This association is on silty mantled till plains characterized by flat areas and slight rises. Slopes are long and smooth. The drainage pattern is well defined.

This association makes up less than 1 percent of the county. It is about 60 percent Vienna soils and 40 percent minor soils.

The well drained Vienna soils are on summits and back slopes. Slopes range from 0 to 6 percent. Typically, the surface layer is very dark gray silt loam. The subsoil is dark brown and yellowish brown silty clay loam in the upper part. It is brown clay loam in the next

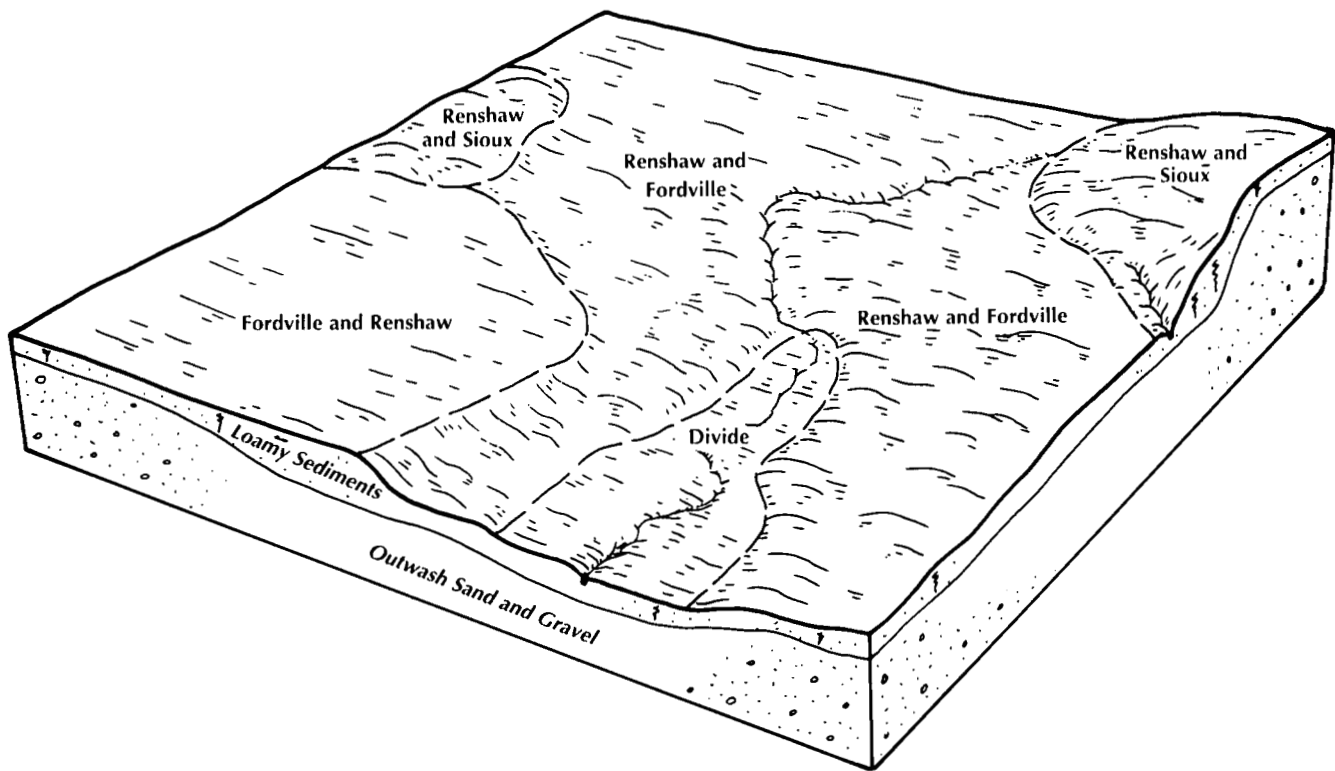


Figure 6.—Typical pattern of soils and underlying material in the Renshaw-Fordville association.

part and pale yellow, calcareous clay loam in the lower part. The underlying material also is pale yellow, calcareous clay loam.

Minor in this association are Aastad, Brookings, Buse, Fordville, Forman, and Renshaw soils. Aastad, Buse, and Forman soils do not have a silty mantle overlying the glacial till. The moderately well drained Aastad soils are on foot slopes. Buse soils are on shoulder slopes, and Forman soils are on back slopes. The moderately well drained Brookings soils are on foot slopes. Fordville and Renshaw soils are on back slopes. They are underlain by sand and gravel.

About 85 percent of this association is cropland. Corn, wheat, oats, soybeans, and alfalfa are the main crops. Measures that control erosion and conserve moisture are the main management needs. The soils in this association are suited to cultivated crops, tame pasture and hay, and range.

Level to Steep, Silty and Loamy Soils on Outwash Plains and in Outwash Channels

These soils formed mainly in loamy sediments over sand and gravel on outwash plains. They are dominantly level to moderately sloping, but they are

strongly sloping to steep in some areas. They make up about 15 percent of the county. About 60 percent of the acreage is cropland. Wheat, oats, barley, and alfalfa are the main crops. Some areas are irrigated. Controlling erosion and conserving moisture are the main management concerns.

11. Divide-Colvin Association

Somewhat poorly drained, level to gently sloping, loamy soils over gravelly material on outwash plains and poorly drained, level, silty soils in outwash channels

This association is characterized by large flat areas and slight rises. Slopes are long and smooth. The drainage pattern is poorly defined.

This association makes up about 3 percent of the county. It is about 40 percent Divide soils, 35 percent Colvin soils, and 25 percent minor soils.

The somewhat poorly drained Divide soils are on foot slopes. Slopes range from 0 to 5 percent. Typically, the surface layer is dark gray, calcareous loam. The subsoil is light brownish gray and light yellowish brown, calcareous clay loam. It is mottled in the lower part. The underlying material is light yellowish brown, calcareous gravelly sand.

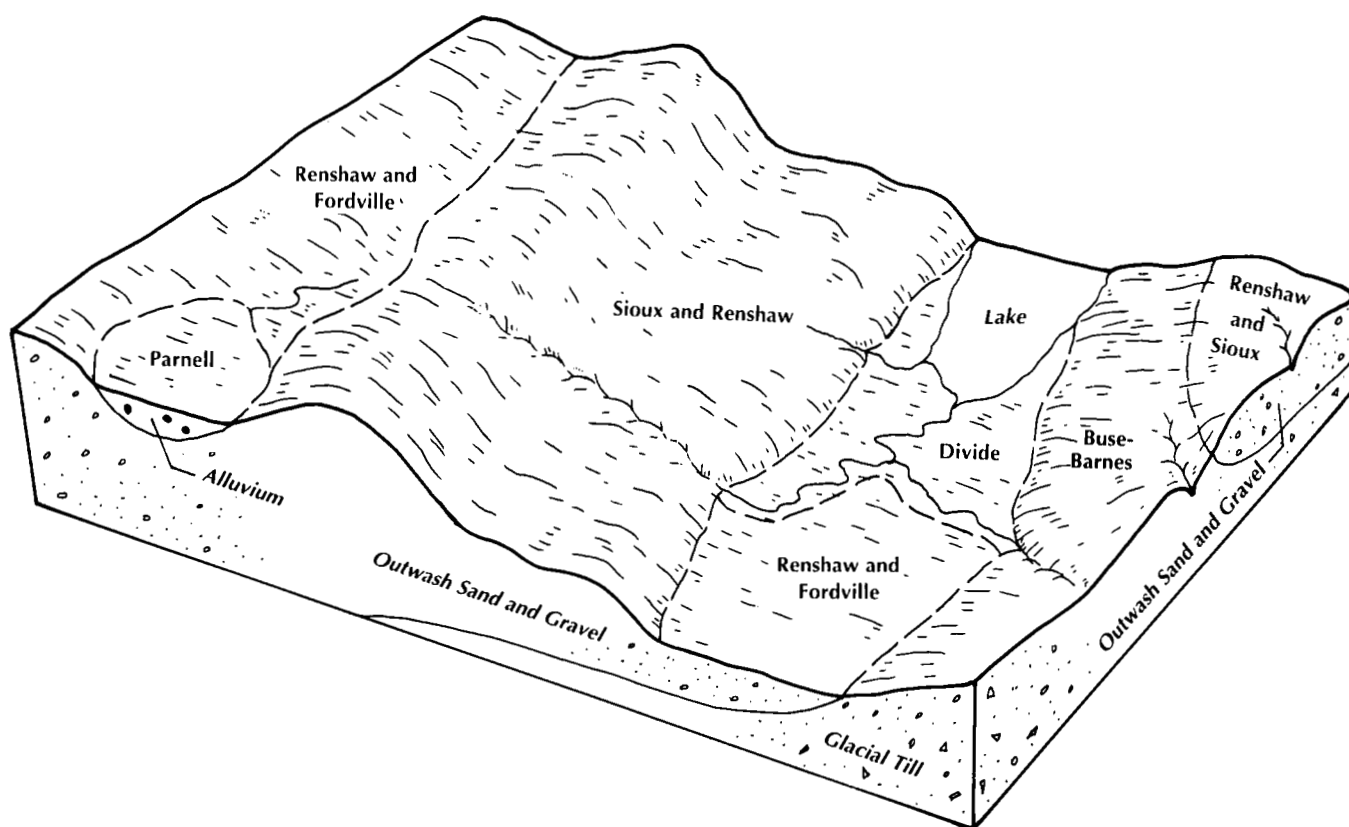


Figure 7.—Typical pattern of soils and underlying material in the Sioux-Renshaw association.

The poorly drained Colvin soils are on toe slopes. Slopes are less than 1 percent. Typically, the surface layer is dark gray, calcareous silty clay loam. The subsoil is gray, calcareous silty clay loam in the upper part. It is light gray and white, mottled, calcareous silt loam in the lower part. The underlying material is light gray, calcareous, mottled silty clay loam.

Minor in this association are Cubden, Fordville, Hamerly, Marysland, Renshaw, and Vallers soils. The somewhat poorly drained Cubden soils are not underlain by sand and gravel. They are on foot slopes. The well drained Fordville and somewhat excessively drained Renshaw soils are on back slopes. Hamerly and Vallers soils are not underlain by sand and gravel and contain more sand and less silt than the Colvin soils. They are around the edges of basins. The poorly drained Marysland soils are underlain by sand and gravel. They are on toe slopes.

About 45 percent of this association is cropland. Wheat, oats, barley, and alfalfa are the main crops. Some areas of the wetter soils support grass and are used for grazing or hay. Controlling erosion and maintaining fertility are the main concerns affecting the

management of the major soils for crops. The soils in this association are suited to cultivated crops, tame pasture and hay, and range, but wetness is a limitation.

12. Renshaw-Fordville Association

Somewhat excessively drained and well drained, level to gently sloping, loamy soils over gravelly material on outwash plains

This association is characterized by large, level and gently sloping landscapes. Slopes are long and smooth. The drainage pattern is poorly defined in most areas. Most drainageways terminate in basins.

This association makes up about 6 percent of the county. It is about 40 percent Renshaw soils, 35 percent Fordville soils, and 25 percent minor soils (fig. 6).

The somewhat excessively drained Renshaw soils are on back slopes. Slopes range from 0 to 6 percent. Typically, the surface layer is very dark gray loam. The subsoil is dark grayish brown and brown loam. The underlying material is grayish brown and pale brown, calcareous gravelly sand and very gravelly sand.

The well drained Fordville soils are on back slopes and foot slopes. Slopes range from 0 to 6 percent. Typically, the surface layer is very dark gray loam. The subsoil is very dark grayish brown and dark brown loam. The underlying material is light brownish gray and pale brown, calcareous gravelly loamy sand and gravelly sand.

Minor in this association are Divide and Sioux soils. The moderately well drained Divide soils are on foot slopes. The excessively drained Sioux soils are on shoulder slopes.

About 80 percent of this association is cropland. Wheat, barley, oats, corn, and alfalfa are the main crops. Measures that conserve moisture and control erosion are the main management concerns. The soils in this association are suited to cultivated crops, tame pasture and hay, and range, but the moderate and low available water capacity is a limitation. Some areas are irrigated. The major soils are a probable source of sand and gravel.

13. Sioux-Renshaw Association

Excessively drained and somewhat excessively drained, moderately sloping to steep, loamy soils over gravelly material on outwash plains

This association is characterized by short slopes. Most areas are moderately sloping to strongly sloping, but some areas along the terminal moraine are steep. The drainage pattern is poorly defined. Most drainageways terminate in large basins. Scattered stones are on the surface in some areas.

This association makes up about 6 percent of the county. It is about 45 percent Sioux soils, 30 percent

Renshaw soils, and 25 percent minor soils (fig. 7).

The excessively drained Sioux soils are on shoulder slopes. Slopes range from 6 to 40 percent. Typically, the surface layer is very dark gray, calcareous gravelly loam. The next layer is dark brown, calcareous gravelly loam. The underlying material is light yellowish brown, calcareous very gravelly sand.

The somewhat excessively drained Renshaw soils are on back slopes. Slopes range from 6 to 25 percent. Typically, the surface layer is very dark gray loam. The subsoil is dark grayish brown and brown loam. The underlying material is grayish brown and pale brown, calcareous gravelly sand and very gravelly sand.

Minor in this association are Barnes, Buse, Divide, Fordville, and Parnell soils. The well drained Barnes and Buse soils are not underlain by sand and gravel. Barnes soils are on back slopes. Buse soils are on shoulder slopes. The moderately well drained Divide soils are on foot slopes. The well drained Fordville soils are on back slopes. The very poorly drained Parnell soils are in basins.

About 70 percent of this association supports native grasses and is used for grazing or hay. Maintaining the most productive grasses and controlling erosion are the main concerns affecting range management. Some of the less sloping areas are cultivated. Wheat, oats, barley, and alfalfa are the main crops. Controlling erosion and conserving moisture are the main concerns affecting the management of cultivated areas. The soils in this association are suited to range. In addition, the less sloping areas of the Renshaw soils are suited to cultivated crops and tame pasture and hay, but the low and very low available water capacity is a limitation. The major soils are a probable source of sand and gravel.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under the heading "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Hamerly loam, 0 to 2 percent slopes, is a phase of the Hamerly series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Buse-Barnes loams, 9 to 20 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ

substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

Aa—Aastad loam

Composition

Aastad and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains

Landform position: Foot slopes

Slope range: 0 to 2 percent

Shape of areas: Long and narrow

Size of areas: 5 to 100 acres

Typical Profile

Surface soil:

0 to 14 inches—very dark gray loam

Subsoil:

14 to 29 inches—dark grayish brown and light olive brown clay loam

29 to 38 inches—light yellowish brown, mottled, calcareous clay loam

Underlying material:

38 to 60 inches—olive yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Moderately well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: 2.5 to 4.0 feet

Flooding: None

Ponding: None

Permeability: Moderately slow

Available water capacity: High

Organic matter content: High

Surface runoff: Slow

Other properties: Runoff water flows over the Aastad soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:

- The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on back slopes
- The well drained Forman soils, which are dark to a depth of less than 16 inches; on back slopes
- The somewhat poorly drained Hamerly soils, which are calcareous at or near the surface; on foot slopes
- The very poorly drained Parnell soils, which are dark to a depth of more than 24 inches; in basins

Similar soils:

- Soils that are dark to a depth of more than 24 inches
- Soils that have an increased content of clay in the subsoil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Slight

Management measures:

- Managing crop residue conserves moisture and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: I-3

Range site: Loamy Overflow

Windbreak suitability group: 1

Pasture suitability group: K

An—Aberdeen-Nahon silty clay loams

Composition

Aberdeen and similar soils: 40 to 55 percent

Nahon and similar soils: 30 to 45 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Lake plains

Landform position: Aberdeen—summits and back slopes; Nahon—foot slopes

Slope range: 0 to 2 percent

Shape of areas: Irregular

Size of areas: 20 to 160 acres

Typical Profile

Aberdeen

Surface layer:

0 to 8 inches—dark gray silty clay loam

Transitional layer:

8 to 12 inches—dark gray and gray silty clay loam

Subsoil:

12 to 37 inches—dark gray and grayish brown silty clay

37 to 45 inches—light brownish gray, calcareous silty clay with nests of gypsum and other salts

Underlying material:

45 to 53 inches—light gray, calcareous silty clay loam

53 to 60 inches—light gray, mottled, calcareous, varved silty clay loam

Nahon

Surface layer:

0 to 7 inches—dark gray silty clay loam

Subsurface layer:

7 to 8 inches—gray silt loam

Subsoil:

8 to 19 inches—dark gray silty clay

19 to 31 inches—dark gray and light brownish gray silty clay with nests of salt

31 to 40 inches—light brownish gray, calcareous silty clay loam with nests of salt

Underlying material:

40 to 55 inches—light gray, calcareous silty clay loam

55 to 60 inches—white and pale yellow, calcareous, varved silty clay loam

Soil Properties and Qualities

Drainage class: Moderately well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: 3.5 to 5.0 feet

Flooding: None

Ponding: None

Permeability: Aberdeen—slow; Nahon—very slow

Available water capacity: Aberdeen—high; Nahon—moderate

Organic matter content: Moderate

Surface runoff: Slow

Other properties: Both soils have a sodium-affected subsoil.

Inclusions

Contrasting inclusions:

- The well drained Beotia soils, which have less clay and more silt in the subsoil than the major soils; on the lower back slopes and the upper foot slopes
- The somewhat poorly drained Exline soils, which have

sodium salts above a depth of 16 inches; on the lower foot slopes

- The moderately well drained Harmony soils, which do not have a sodium-affected subsoil; on summits and back slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: The sodium-affected subsoil, which adversely affects crop growth by restricting the penetration of plant roots; a slow rate of water infiltration

Management measures:

- Leaving crop residue on the surface, minimizing tillage, tilling in a timely manner, and including grasses and legumes in the cropping system conserve moisture and maintain organic matter content and tilth.
- Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: Aberdeen—IIIs-1; Nahon—IVs-2

Range site: Aberdeen—Clayey; Nahon—Claypan

Windbreak suitability group: Aberdeen—4; Nahon—9

Pasture suitability group: Aberdeen—E; Nahon—C

Aq—Aquents, saline

Composition

Aquents and similar soils: 90 to 99 percent

Contrasting inclusions: 1 to 10 percent

Setting

Landform: Beach terraces

Landform position: Toe slopes

Slope range: 0 to 1 percent

Shape of areas: Long and narrow

Size of areas: 5 to 50 acres

Typical Profile

Surface layer:

0 to 2 inches—light colored, calcareous loam

Underlying material:

2 to 60 inches—light colored, calcareous clay loam

Soil Properties and Qualities

Drainage class: Very poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: 2 feet above to 1 foot below the surface

Flooding: None

Ponding: Frequent for very long periods

Permeability: Moderately slow

Available water capacity: Moderate

Organic matter content: Moderately low

Surface runoff: Very slow

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Mauvais and Minnewasta soils, which have fewer salts than the Aquents and have a cover of vegetation; on toe slopes

Similar soils:

- Soils that are sandy

Use and Management

Management considerations:

- Because of wetness and the high content of salt, areas of these soils are not suited to crops. They should be maintained as wildlife habitat.

Interpretive Groups

Land capability classification: VIIIs-1

Range site: Not assigned

Windbreak suitability group: 10

Pasture suitability group: NS

ArB—Arvilla sandy loam, 2 to 6 percent slopes

Composition

Arvilla and similar soils: 80 to 90 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Outwash plains

Landform position: Summits and back slopes

Slope range: 2 to 6 percent

Shape of areas: Irregular

Size of areas: 10 to 40 acres

Typical Profile

Surface layer:

0 to 8 inches—very dark gray sandy loam

Subsoil:

8 to 19 inches—very dark gray and very dark grayish brown sandy loam

Underlying material:

19 to 30 inches—grayish brown, calcareous gravelly coarse sand

30 to 60 inches—brown, calcareous coarse sand

Soil Properties and Qualities

Drainage class: Somewhat excessively drained

Depth to bedrock: Very deep
Depth to contrasting layer: 14 to 25 inches over gravelly material
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Rapid
Available water capacity: Low
Organic matter content: Moderate
Surface runoff: Medium

Inclusions

Contrasting inclusions:

- The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes
- The well drained Fordville soils, which have more silt and clay in the subsoil than the Arvilla soil and are dark to a greater depth; in positions on the landscape similar to those of the Arvilla soil
- The well drained Egeland soils, which do not have gravelly underlying material; on back slopes

Similar soils:

- Soils that are sandy

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, and wheat
Management concerns: Low available water capacity, wind erosion, and water erosion

Management measures:

- This soil is better suited to early maturing crops, such as small grain.
- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains the content of organic matter.
- Irrigation helps to overcome the limited water storage capacity if water is of adequate quantity and quality.

Interpretive Groups

Land capability classification: IVs-2
Range site: Shallow to Gravel
Windbreak suitability group: 6
Pasture suitability group: D2

Ba—Bearden silt loam

Composition

Bearden and similar soils: 85 to 99 percent
 Contrasting inclusions: 1 to 15 percent

Setting

Landform: Lake plains
Landform position: Foot slopes
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 0 to 10 acres

Typical Profile

Surface layer:

0 to 8 inches—dark gray, calcareous silt loam

Transitional layer:

8 to 12 inches—gray, calcareous silt loam

Subsoil:

12 to 26 inches—light gray, calcareous silt loam
 26 to 39 inches—light gray, mottled, calcareous silt loam with nests of salt

Underlying material:

39 to 60 inches—pale yellow, mottled, calcareous silt loam

Soil Properties and Qualities

Drainage class: Somewhat poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: 1.5 to 3.5 feet

Flooding: None

Ponding: None

Permeability: Moderate to slow

Available water capacity: High

Organic matter content: Moderate

Surface runoff: Slow

Other properties: A high content of lime

Inclusions

Contrasting inclusions:

- The well drained Beotia soils, which are dark to a depth of more than 16 inches; on foot slopes
- The poorly drained Colvin soils on toe slopes
- The poorly drained Tonka soils in basins

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: The high content of lime, which adversely affects the availability of plant nutrients; wind erosion

Management measures:

- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to

control erosion and maintains organic matter content, fertility, and tilth.

Interpretive Groups

Land capability classification: IIe-4

Range site: Limy Subirrigated

Windbreak suitability group: 1

Pasture suitability group: F

BaB—Bearden-Huffton silt loams, 1 to 6 percent slopes

Composition

Bearden and similar soils: 45 to 55 percent

Huffton and similar soils: 35 to 45 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Lake plains

Landform position: Bearden—foot slopes; Huffton—back slopes

Slope range: Bearden—1 to 2 percent; Huffton—2 to 6 percent

Shape of areas: Irregular

Size of areas: 5 to 10 acres

Typical Profile

Bearden

Surface layer:

0 to 8 inches—dark gray, calcareous silt loam

Transitional layer:

8 to 12 inches—gray, calcareous silt loam

Subsoil:

12 to 26 inches—light gray, calcareous silt loam

26 to 39 inches—light gray, mottled, calcareous silt loam with nests of salt

Underlying material:

39 to 60 inches—pale yellow, mottled, calcareous silt loam

Huffton

Surface layer:

0 to 7 inches—dark grayish brown, calcareous silt loam

Subsoil:

7 to 25 inches—light gray and pale yellow, calcareous silt loam with nests of salt

Underlying material:

25 to 35 inches—pale yellow, calcareous, varved silt loam with nests of salt

35 to 60 inches—pale yellow and gray, calcareous, varved silt loam

Soil Properties and Qualities

Drainage class: Bearden—somewhat poorly drained;

Huffton—well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: Bearden—1.5 to 3.5 feet; Huffton—more than 6 feet

Flooding: None

Ponding: None

Permeability: Bearden—moderate to slow; Huffton—moderate in the upper part and moderate to slow in the lower part

Available water capacity: Bearden—high; Huffton—moderate

Organic matter content: Bearden—moderate; Huffton—moderately low

Surface runoff: Medium

Other properties: A high content of lime in both soils; a high content of soluble salts in the Huffton soil

Inclusions

Contrasting inclusions:

- The well drained Beotia soils, which are dark to a depth of more than 16 inches; on foot slopes
- The well drained Great Bend soils on back slopes
- The well drained Zell soils on shoulder slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Wind erosion and water erosion; the high content of lime, which adversely affects the availability of plant nutrients

Management measures:

- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming, terraces, and grassed waterways help to control water erosion, but the slopes in some areas are too short or too irregular for contour farming.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.

Interpretive Groups

Land capability classification: Bearden—IIe-4; Huffton—IVe-2

Range site: Bearden—Limy Subirrigated; Huffton—Thin Upland

Windbreak suitability group: Bearden—1; Huffton—8

Pasture suitability group: Bearden—F; Huffton—G

BbA—Beotia silt loam, 0 to 2 percent slopes**Composition**

Beotia and similar soils: 85 to 95 percent
 Contrasting inclusions: 5 to 15 percent

Setting

Landform: Lake plains
Landform position: Foot slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 0 to 5 acres

Typical Profile

Surface soil:
 0 to 10 inches—dark gray silt loam
Subsoil:
 10 to 24 inches—grayish brown silt loam
 24 to 35 inches—light brownish gray, calcareous silt loam
Underlying material:
 35 to 54 inches—light brownish gray and light gray, calcareous silt loam and silty clay loam; mottled in the lower part
 54 to 60 inches—light brownish gray, calcareous, varved silt loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the upper part, moderate to slow in the lower part
Available water capacity: High
Organic matter content: High
Surface runoff: Slow

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Bearden soils, which are calcareous at or near the surface; on the lower foot slopes
- The moderately well drained Harmony soils, which have more clay than the Beotia soil; on foot slopes

Use and Management**Cropland**

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat
Management concerns: Few limitations
Management measures:

- Measures that conserve moisture are needed.

- Managing crop residue conserves moisture and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: 11c-3
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: K

Bc—Beotia-Rondell silt loams, 0 to 3 percent slopes**Composition**

Beotia and similar soils: 40 to 55 percent
 Rondell and similar soils: 20 to 40 percent
 Contrasting inclusions: 10 to 20 percent

Setting

Landform: Lake plains
Landform position: Beotia—foot slopes; Rondell—the lower foot slopes
Slope range: Beotia—0 to 2 percent; Rondell—0 to 3 percent
Shape of areas: Irregular
Size of areas: 10 to 80 acres

Typical Profile**Beotia**

Surface soil:
 0 to 10 inches—dark gray silt loam
Subsoil:
 10 to 24 inches—grayish brown silt loam
 24 to 35 inches—light brownish gray, calcareous silt loam
Underlying material:
 35 to 54 inches—light brownish gray and light gray, calcareous silt loam and silty clay loam; mottled in the lower part
 54 to 60 inches—light brownish gray, calcareous, varved silt loam

Rondell

Surface soil:
 0 to 12 inches—dark gray, calcareous silt loam
Subsoil:
 12 to 31 inches—pale yellow, calcareous silt loam
Underlying material:
 31 to 60 inches—pale yellow, mottled, calcareous, varved silt loam

Soil Properties and Qualities

Drainage class: Beotia—well drained; Rondell—moderately well drained
Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: Beotia—more than 6 feet; Rondell—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate in the upper part, moderate to slow in the lower part
Available water capacity: High
Organic matter content: Beotia—high; Rondell—moderate
Surface runoff: Slow
Other properties: A high content of lime in the Rondell soil

Inclusions

Contrasting inclusions:

- The well drained Great Bend soils, which are not calcareous at or near the surface and are dark to a depth of less than 16 inches; on back slopes
- The well drained Putney soils, which have salt within a depth of 20 inches; on back slopes
- The poorly drained Tonka soils in basins

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Beotia—few limitations; Rondell—wind erosion and the high content of lime, which adversely affects the availability of plant nutrients

Management measures:

- Measures that conserve moisture are needed in areas of the Beotia soil.
- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.

Interpretive Groups

Land capability classification: Beotia—IIC-3; Rondell—IIE-4

Range site: Beotia—Silty; Rondell—Limy Subirrigated

Windbreak suitability group: Beotia—3; Rondell—8

Pasture suitability group: Beotia—K; Rondell—F

BnD—Buse-Barnes loams, 9 to 20 percent slopes

Composition

Buse and similar soils: 40 to 55 percent

Barnes and similar soils: 35 to 50 percent
 Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines

Landform position: Buse—shoulder slopes; Barnes—back slopes

Slope range: Buse—9 to 20 percent; Barnes—9 to 15 percent

Shape of areas: Irregular

Size of areas: 10 to 500 acres

Typical Profile

Buse

Surface layer:

0 to 7 inches—dark grayish brown, calcareous loam

Subsoil:

7 to 22 inches—light yellowish brown, calcareous clay loam

Underlying material:

22 to 60 inches—light yellowish brown, calcareous clay loam

Barnes

Surface layer:

0 to 6 inches—very dark gray loam

Subsoil:

6 to 13 inches—dark grayish brown loam

13 to 32 inches—light brownish gray, calcareous clay loam

Underlying material:

32 to 60 inches—light yellowish brown, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Moderately slow

Available water capacity: High

Organic matter content: Buse—moderately low; Barnes—high

Surface runoff: Rapid

Other properties: A high content of lime in the Buse soil

Inclusions

Contrasting inclusions:

- The moderately well drained Aastad soils on foot slopes
- The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes

Similar soils:

- Soils that have a thinner surface layer than the Buse soil
- Soils that have more clay in the subsoil than the Barnes soil

Use and Management**Cropland and pasture**

Main crops: Buse—generally not suited to crops;

Barnes—alfalfa, barley, corn, oats, and wheat

Management concerns: Buse—wind erosion and water erosion and the high content of lime, which adversely affects the availability of plant nutrients; Barnes—water erosion

Management measures:

- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.
- Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Buse—Vle-3; Barnes—IVe-1

Range site: Buse—Thin Upland; Barnes—Silty

Windbreak suitability group: Buse—8; Barnes—3

Pasture suitability group: Buse—G; Barnes—F

BoE—Buse-Barnes loams, 9 to 40 percent slopes, very stony***Composition***

Buse and similar soils: 45 to 60 percent

Barnes and similar soils: 25 to 45 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines

Landform position: Buse—shoulder slopes; Barnes—back slopes

Slope range: Buse—9 to 40 percent; Barnes—9 to 25 percent

Shape of areas: Irregular

Size of areas: 10 to 500 acres

Typical Profile**Buse**

Surface layer:

0 to 7 inches—dark grayish brown, calcareous loam

Subsoil:

7 to 22 inches—light yellowish brown, calcareous clay loam

Underlying material:

22 to 60 inches—light yellowish brown, calcareous clay loam

Barnes

Surface layer:

0 to 6 inches—very dark gray loam

Subsoil:

6 to 13 inches—dark grayish brown loam

13 to 32 inches—light brownish gray, calcareous clay loam

Underlying material:

32 to 60 inches—light yellowish brown, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Moderately slow

Available water capacity: High

Organic matter content: Buse—moderately low; Barnes—high

Surface runoff: Rapid

Other properties: A high content of lime in the Buse soil; scattered stones and boulders on the surface of both soils

Inclusions

Contrasting inclusions:

- The moderately well drained Aastad soils on foot slopes
- The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes

Similar soils:

- Soils that have a thinner surface layer than the Buse soil
- Soils that have more clay in the subsoil than the Barnes soil

Use and Management**Rangeland**

Management concerns: Water erosion, numerous stones and boulders (granitic rocks 1 to 3 feet in diameter covering 0.1 to 3.0 percent of the surface)

Management measures:

- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Buse—VIIIs-1; Barnes—VIIIs-1

Range site: Buse—Thin Upland; Barnes—Silty

Windbreak suitability group: Buse—10; Barnes—10

Pasture suitability group: Buse—NS; Barnes—NS

BpE—Buse-Barnes-Parnell complex, 0 to 25 percent slopes, stony

Composition

Buse and similar soils: 35 to 50 percent

Barnes and similar soils: 25 to 40 percent

Parnell and similar soils: 15 to 30 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines

Landform position: Buse—shoulder slopes; Barnes—back slopes; Parnell—basins

Slope range: Buse—9 to 25 percent; Barnes—9 to 25 percent; Parnell—0 to 1 percent

Shape of areas: Irregular

Size of areas: 20 to 500 acres

Typical Profile

Buse

Surface layer:

0 to 7 inches—dark grayish brown, calcareous loam

Subsoil:

7 to 22 inches—light yellowish brown, calcareous clay loam

Underlying material:

22 to 60 inches—light yellowish brown, calcareous clay loam

Barnes

Surface layer:

0 to 6 inches—very dark gray loam

Subsoil:

6 to 13 inches—dark grayish brown loam

13 to 32 inches—light brownish gray, calcareous clay loam

Underlying material:

32 to 60 inches—light yellowish brown, calcareous clay loam

Parnell

Surface soil:

0 to 17 inches—dark gray silty clay loam

Subsoil:

17 to 38 inches—dark gray silty clay

Underlying material:

38 to 47 inches—dark gray, calcareous clay

47 to 60 inches—light gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Buse—well drained; Barnes—well drained; Parnell—very poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: Buse—at a depth of more than 6 feet; Barnes—at a depth of more than 6 feet; Parnell—1.0 foot above to 0.5 foot below the surface

Flooding: None

Ponding: Buse—none; Barnes—none; Parnell—frequent for very long periods

Permeability: Buse—moderately slow; Barnes—moderately slow; Parnell—slow

Available water capacity: High

Organic matter content: Buse—moderately low; Barnes—high; Parnell—high

Surface runoff: Buse—rapid; Barnes—rapid; Parnell—negligible

Other properties: A high content of lime in the Buse soil, scattered stones and boulders on the surface of the Buse and Barnes soils

Inclusions

Contrasting inclusions:

- The moderately well drained Aastad soils on foot slopes
- The somewhat poorly drained Hamerly soils on foot slopes
- The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes
- The poorly drained Vallery soils on toe slopes

Similar soils:

- Soils that have a thinner surface layer than the Buse soil
- Soils that have more clay in the subsoil than the Barnes soil
- Calcareous soils in basins

Use and Management

Rangeland

Management concerns: Buse and Barnes—water erosion and stoniness (granitic rocks 1 to 3 feet in diameter covering less than 0.1 percent of the surface); Parnell—wetness

Management measures:

- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.
- The Parnell soil should be maintained as wildlife areas

and livestock watering areas.

Interpretive Groups

Land capability classification: Buse—VIIIs-1; Barnes—VIIIs-1; Parnell—Vw-2

Range site: Buse—Thin Upland; Barnes—Silty; Parnell—Shallow Marsh

Windbreak suitability group: Buse—10; Barnes—10; Parnell—10

Pasture suitability group: Buse—NS; Barnes—NS; Parnell—B2

BrE—Buse-Langhei complex, 15 to 40 percent slopes

Composition

Buse and similar soils: 40 to 55 percent

Langhei and similar soils: 35 to 50 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines

Landform position: Buse—shoulder slopes and back slopes; Langhei—shoulder slopes

Slope range: Buse—15 to 40 percent; Langhei—25 to 40 percent

Shape of areas: Irregular

Size of areas: 10 to 200 acres

Typical Profile

Buse

Surface layer:

0 to 7 inches—dark grayish brown, calcareous loam

Subsoil:

7 to 22 inches—light yellowish brown, calcareous clay loam

Underlying material:

22 to 60 inches—light yellowish brown, calcareous clay loam

Langhei

Surface layer:

0 to 4 inches—dark gray, calcareous clay loam

Underlying material:

4 to 60 inches—light brownish gray and pale yellow, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Moderately slow

Available water capacity: High

Organic matter content: Buse—moderately low; Langhei—low

Surface runoff: Buse—rapid; Langhei—very rapid

Other properties: A high content of lime in both soils

Inclusions

Contrasting inclusions:

- The moderately well drained Aastad soils on foot slopes
- The well drained Barnes and Forman soils, which are dark to a depth of more than 7 inches; on back slopes

Use and Management

Rangeland

Management concerns: Water erosion

Management measures:

- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Buse—VIIe-1; Langhei—VIIe-1

Range site: Buse—Thin Upland; Langhei—Thin Upland

Windbreak suitability group: Buse—10; Langhei—10

Pasture suitability group: Buse—NS; Langhei—NS

BsE—Buse-La Prairie, channeled-Barnes loams, 0 to 40 percent slopes

Composition

Buse and similar soils: 30 to 50 percent

La Prairie and similar soils: 25 to 35 percent

Barnes and similar soils: 20 to 30 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines and flood plains

Landform position: Buse—shoulder slopes; La Prairie—high flood plains; Barnes—back slopes

Slope range: Buse—9 to 40 percent; La Prairie—0 to 2 percent; Barnes—9 to 25 percent

Shape of areas: Irregular

Size of areas: 10 to 500 acres

Typical Profile

Buse

Surface layer:

0 to 7 inches—dark grayish brown, calcareous loam

Subsoil:

7 to 22 inches—light yellowish brown, calcareous clay loam

Underlying material:

22 to 60 inches—light yellowish brown, calcareous clay loam

La Prairie*Surface layer:*

0 to 8 inches—very dark gray loam

Subsurface layer:

8 to 16 inches—dark gray, calcareous loam

Subsoil:

16 to 31 inches—gray, calcareous clay loam

Underlying material:

31 to 48 inches—light brownish gray, calcareous clay loam

48 to 60 inches—gray, calcareous clay loam

Barnes*Surface layer:*

0 to 6 inches—very dark gray loam

Subsoil:

6 to 13 inches—dark grayish brown loam

13 to 32 inches—light brownish gray, calcareous clay loam

Underlying material:

32 to 60 inches—light yellowish brown, calcareous clay loam

Soil Properties and Qualities

Drainage class: Buse—well drained; La Prairie—moderately well drained; Barnes—well drained

Depth to bedrock: Very deep

Depth to contrasting layer: Buse—more than 60 inches; La Prairie—40 to more than 60 inches over clayey or sandy material; Barnes—more than 60 inches

Depth to seasonal high water table: Buse—more than 6 feet; La Prairie—3.5 to 5.0 feet; Barnes—more than 6 feet

Flooding: Buse—none; La Prairie—occasional for brief periods; Barnes—none

Ponding: None

Permeability: Buse—moderately slow; La Prairie—moderate; Barnes—moderately slow

Available water capacity: High

Organic matter content: Buse—moderately low; La Prairie—high; Barnes—high

Surface runoff: Buse—very rapid; La Prairie—slow; Barnes—rapid

Other properties: A high content of lime in the Buse soil, a meandering channel that typically dissects areas of the La Prairie soil

Inclusions*Contrasting inclusions:*

- The moderately well drained Aastad soils on foot slopes

- The poorly drained Holmquist soils, which are stratified; on low flood plains
- The well drained Kranzburg soils, which have less sand and more silt in the surface layer than the major soils; on back slopes
- The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes

Similar soils:

- Soils that have a thinner surface layer than the Buse soil
- Soils that have more silt and less sand than the La Prairie soil
- Soils that have more clay in the subsoil than the Barnes soil

Use and Management**Rangeland**

Management concerns: Buse and Barnes—water erosion; La Prairie—meandering channels

Management measures:

- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Buse—Vllc-1; La Prairie—Vllw-1; Barnes—Vle-1

Range site: Buse—Thin Upland; La Prairie—Loamy Overflow; Barnes—Silty

Windbreak suitability group: Buse—10; La Prairie—1; Barnes—10

Pasture suitability group: Buse—NS; La Prairie—NS; Barnes—NS

BxE—Buse-Sioux complex, 9 to 40 percent slopes**Composition**

Buse and similar soils: 45 to 60 percent
Sioux and similar soils: 20 to 40 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Moraines

Landform position: Shoulder slopes and back slopes

Slope range: 9 to 40 percent

Shape of areas: Irregular

Size of areas: 10 to 100 acres

Typical Profile**Buse***Surface layer:*

0 to 7 inches—dark grayish brown, calcareous loam

Subsoil:

7 to 22 inches—light yellowish brown, calcareous clay loam

Underlying material:

22 to 60 inches—light yellowish brown, calcareous clay loam

Sioux*Surface layer:*

0 to 6 inches—very dark gray, calcareous gravelly loam

Transitional layer:

6 to 9 inches—dark brown, calcareous gravelly loam

Underlying material:

9 to 60 inches—light yellowish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Buse—well drained; Sioux—excessively drained

Depth to bedrock: Very deep

Depth to contrasting layer: Buse—more than 60 inches; Sioux—6 to 14 inches over gravelly material

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Buse—moderately slow; Sioux—rapid

Available water capacity: Buse—high; Sioux—very low

Organic matter content: Moderately low

Surface runoff: Buse—very rapid; Sioux—medium

Other properties: A high content of lime in the Buse soil

Inclusions*Contrasting inclusions:*

- The moderately well drained Aastad soils on foot slopes
- The well drained Barnes soils, which are dark to a depth of more than 7 inches; on back slopes
- The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on back slopes

Similar soils:

- Soils that have a thinner surface layer than the Buse soil
- Soils that have clay loam underlying material below a depth of 40 inches

Use and Management**Rangeland**

Management concerns: Buse—water erosion; Sioux—water erosion, very low available water capacity

Management measures:

- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Buse—VIIe-1; Sioux—VIIIs-2

Range site: Buse—Thin Upland; Sioux—Very Shallow

Windbreak suitability group: Buse—10; Sioux—10

Pasture suitability group: Buse—NS; Sioux—NS

Ca—Cavour-Ferney loams**Composition**

Cavour and similar soils: 45 to 55 percent

Ferney and similar soils: 30 to 45 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains

Landform position: Cavour—summits and back slopes; Ferney—foot slopes

Slope range: 0 to 2 percent

Shape of areas: Irregular

Size of areas: 10 to 100 acres

Typical Profile**Cavour***Surface layer:*

0 to 6 inches—dark gray loam

Subsurface layer:

6 to 7 inches—dark gray and gray loam

Subsoil:

7 to 19 inches—dark gray and grayish brown clay loam

19 to 31 inches—light brownish gray, calcareous clay loam with nests of gypsum and other salts

Underlying material:

31 to 47 inches—light brownish gray, calcareous clay loam with nests of gypsum and other salts

47 to 60 inches—pale yellow, mottled, calcareous clay loam with nests of gypsum and other salts

Ferney*Surface layer:*

0 to 4 inches—dark gray loam

Subsoil:

4 to 9 inches—dark gray clay loam

9 to 15 inches—grayish brown, calcareous clay loam with nests of salt

15 to 38 inches—light brownish gray and grayish brown, calcareous clay loam with nests of gypsum and other salts

Underlying material:

38 to 60 inches—light yellowish brown, calcareous clay loam with nests of gypsum and other salts

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Very slow
Available water capacity: Cavour—moderately low; Ferney—moderate
Organic matter content: Cavour—high; Ferney—moderately low
Surface runoff: Slow
Other properties: A sodium-affected subsoil in both soils

Inclusions

Contrasting inclusions:

- The moderately well drained Cresbard soils on back slopes
- The poorly drained Tonka soils, which do not have a sodium-affected subsoil; in basins

Use and Management

Cropland

Main crops: Cavour—alfalfa, barley, oats, and wheat; Ferney—generally not suited to crops
Management concerns: The sodium-affected subsoil, which adversely affects crop growth by restricting the penetration of plant roots; a slow rate of water infiltration
Management measures:

- Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system conserve moisture and maintain organic matter content and tilth.
- Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: Cavour—IVs-2; Ferney—VIs-1
Range site: Cavour—Claypan; Ferney—Thin Claypan
Windbreak suitability group: Cavour—9; Ferney—10
Pasture suitability group: Cavour—C; Ferney—NS

Cn—Colvin silty clay loam

Composition

Colvin and similar soils: 75 to 90 percent
 Contrasting inclusions: 10 to 25 percent

Setting

Landform: Lake plains or outwash channels
Landform position: Toe slopes

Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 10 to 200 acres

Typical Profile

Surface layer:
 0 to 7 inches—dark gray, calcareous silty clay loam
Subsoil:
 7 to 18 inches—gray, calcareous silty clay loam
 18 to 27 inches—light gray, mottled, calcareous silt loam
 27 to 36 inches—white, mottled, calcareous silt loam with nests of salt
Underlying material:
 36 to 60 inches—light gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over clayey or sandy material
Seasonal high water table: At the surface to 1 foot below the surface
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: High
Surface runoff: Very slow
Other properties: A high content of lime

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Cubden and Hamerly soils on foot slopes
- The very poorly drained Parnell soils, which are not calcareous at or near the surface and are dark to a depth of more than 24 inches; in basins

Similar soils:

- Soils that have more sand and less silt
- Soils that have gravelly material within a depth of 40 inches
- Soils that have more salts

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, and wheat
Management concerns: Wetness, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:

- In most years this soil is better suited to late planted crops.

- Deferring tillage when the soil is wet helps to minimize surface compaction.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.
- Existing drainage systems should be maintained.

Interpretive Groups

Land capability classification: IVw-3

Range site: Subirrigated

Windbreak suitability group: 10

Pasture suitability group: A

Cr—Cresbard-Cavour loams

Composition

Cresbard and similar soils: 45 to 55 percent

Cavour and similar soils: 25 to 45 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains

Landform position: Cresbard—summits and back slopes;

Cavour—foot slopes

Slope range: 0 to 2 percent

Shape of areas: Irregular

Size of areas: 10 to 100 acres

Typical Profile

Cresbard

Surface layer:

0 to 9 inches—dark gray loam

Transitional layer:

9 to 12 inches—gray and dark gray clay loam

Subsoil:

12 to 20 inches—dark grayish brown clay loam

20 to 42 inches—grayish brown and light brownish gray, calcareous clay loam with nests of salt

Underlying material:

42 to 60 inches—light gray and light brownish gray, mottled, calcareous clay loam with nests of gypsum and other salts

Cavour

Surface layer:

0 to 6 inches—dark gray loam

Subsurface layer:

6 to 7 inches—dark gray and gray loam

Subsoil:

7 to 19 inches—dark gray and grayish brown clay loam

19 to 31 inches—light brownish gray, calcareous clay loam with nests of gypsum and other salts

Underlying material:

31 to 47 inches—light brownish gray, calcareous clay loam with nests of gypsum and other salts

47 to 60 inches—pale yellow, mottled, calcareous clay loam with nests of gypsum and other salts

Soil Properties and Qualities

Drainage class: Moderately well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: 3.5 to 5.0 feet

Flooding: None

Ponding: None

Permeability: Cresbard—slow; Cavour—very slow

Available water capacity: Cresbard—high; Cavour—moderately low

Organic matter content: High

Surface runoff: Slow

Other properties: A sodium-affected subsoil in both soils

Inclusions

Contrasting inclusions:

- The moderately well drained Ferney soils, which have sodium salts above a depth of 16 inches; on foot slopes
- The well drained Forman soils, which do not have a sodium-affected subsoil; on foot slopes
- The poorly drained Harriet soils on low flood plains
- The somewhat poorly drained Hamerly soils, which do not have a sodium-affected subsoil; on foot slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: The sodium-affected subsoil, which adversely affect crop growth by restricting the penetration of plant roots; a slow rate of water infiltration

Management measures:

- Leaving crop residue on the surface, minimizing tillage, tilling in a timely manner, and including grasses and legumes in the cropping system help to control erosion, conserve moisture, and maintain organic matter content and tilth.
- Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: Cresbard—III_s-1; Cavour—IV_s-2

Range site: Cresbard—Clayey; Cavour—Claypan

Windbreak suitability group: Cresbard—4; Cavour—9

Pasture suitability group: Cresbard—E; Cavour—C

Cu—Cubden silty clay loam**Composition**

Cubden and similar soils: 80 to 90 percent
 Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains

Landform position: Foot slopes

Slope range: 0 to 2 percent

Shape of areas: Irregular

Size of areas: 5 to 100 acres

Typical Profile

Surface layer:

0 to 10 inches—very dark gray, calcareous silty clay loam

Subsoil:

10 to 22 inches—gray, calcareous silty clay loam

Underlying material:

22 to 36 inches—light yellowish brown, calcareous silty clay loam

36 to 60 inches—light yellowish brown and light gray, calcareous silt loam

Soil Properties and Qualities

Drainage class: Somewhat poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: 40 to more than 60 inches over loamy glacial till

Depth to seasonal high water table: 1.5 to 3.5 feet

Flooding: None

Ponding: None

Permeability: Moderate

Available water capacity: High

Organic matter content: Moderate

Surface runoff: Slow

Other properties: A high content of lime

Inclusions

Contrasting inclusions:

- The poorly drained Colvin soils on toe slopes
- The well drained Kranzburg and Poinsett soils, which are not calcareous at or near the surface; on back slopes
- The poorly drained Tonka soils, which are not calcareous at or near the surface; in basins

Similar soils:

- Soils that have more sand and less silt
- Soils that have gravelly material within a depth of 40 inches

Use and Management**Cropland**

Main crops: Alfalfa, barley, corn, oats, soybeans, wheat

Management concerns: The high content of lime, which adversely affects the availability of plant nutrients; wind erosion

Management measures:

- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.

Interpretive Groups

Land capability classification: IIs-4

Range site: Limy Subirrigated

Windbreak suitability group: 1

Pasture suitability group: F

Cw—Cubden-Badger silty clay loams**Composition**

Cubden and similar soils: 45 to 60 percent

Badger and similar soils: 30 to 40 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains

Landform position: Cubden—foot slopes; Badger—toe slopes

Slope range: Cubden—0 to 2 percent; Badger—0 to 1 percent

Shape of areas: Long and narrow

Size of areas: 20 to 100 acres

Typical Profile**Cubden**

Surface layer:

0 to 10 inches—very dark gray, calcareous silty clay loam

Subsoil:

10 to 22 inches—gray, calcareous silty clay loam

Underlying material:

22 to 36 inches—light yellowish brown, calcareous silty clay loam

36 to 60 inches—light yellowish brown and light gray, calcareous silt loam

Badger

Surface layer:

0 to 10 inches—very dark gray silty clay loam

Subsoil:

10 to 30 inches—very dark gray and dark gray silty clay

30 to 38 inches—grayish brown silty clay

Underlying material:

38 to 60 inches—light gray, calcareous silty clay loam with nests of gypsum

Soil Properties and Qualities

Drainage class: Somewhat poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: Cubden—40 to more than 60 inches over loamy glacial till; Badger—40 to more than 60 inches over glacial till

Seasonal high water table: Cubden—at a depth of 1.5 to 3.5 feet; Badger—at the surface to 3 feet below the surface

Flooding: Cubden—none; Badger—frequent for brief periods

Ponding: None

Permeability: Cubden—moderate; Badger—slow

Available water capacity: High

Organic matter content: Cubden—moderate; Badger—high

Surface runoff: Cubden—slow; Badger—very slow

Other properties: A high content of lime in the Cubden soil

Inclusions*Contrasting inclusions:*

- The poorly drained Colvin soils on toe slopes
- The well drained Forman and Poinsett soils on back slopes
- The poorly drained Tonka soils in basins
- The moderately well drained Waubay soils on foot slopes

Use and Management**Cropland**

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Cubden—wind erosion and the high content of lime, which adversely affects the availability of plant nutrients; Badger—wetness

Management measures:

- In wet years these soils are better suited to late planted crops.
- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.
- Practices that reduce runoff from adjacent soils help to control wetness.
- Deferring tillage in areas of the Badger soil during wet periods helps to minimize surface compaction.

Interpretive Groups

Land capability classification: Cubden—IIs-4; Badger—IW-1

Range site: Cubden—Limy Subirrigated; Badger—Loamy Overflow

Windbreak suitability group: Cubden—1; Badger—2

Pasture suitability group: Cubden—F; Badger—A

Cx—Cubden-Tonka complex**Composition**

Cubden and similar soils: 35 to 50 percent

Tonka and similar soils: 25 to 40 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains

Landform position: Cubden—foot slopes; Tonka—basins

Slope range: Cubden—0 to 2 percent; Tonka—0 to 1 percent

Shape of areas: Irregular

Size of areas: 5 to 150 acres

Typical Profile**Cubden***Surface layer:*

0 to 10 inches—very dark gray, calcareous silty clay loam

Subsoil:

10 to 22 inches—gray, calcareous silty clay loam

Underlying material:

22 to 36 inches—light yellowish brown, calcareous silty clay loam

36 to 60 inches—light yellowish brown and light gray, calcareous silt loam

Tonka*Surface layer:*

0 to 11 inches—dark gray silt loam

Subsurface layer:

11 to 17 inches—light gray, mottled silt loam

Subsoil:

17 to 42 inches—dark gray, gray, and grayish brown, mottled silty clay

Underlying material:

42 to 60 inches—light yellowish brown, mottled silty clay loam

Soil Properties and Qualities

Drainage class: Cubden—somewhat poorly drained; Tonka—poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: Cubden—40 to more than 60

inches over loamy glacial till; Tonka—more than 60 inches

Seasonal high water table: Cubden—at a depth of 1.5 to 3.5 feet; Tonka—0.5 foot above to 1.0 foot below the surface

Flooding: None

Ponding: Cubden—none; Tonka—frequent for long periods

Permeability: Cubden—moderate; Tonka—slow

Available water capacity: High

Organic matter content: Cubden—moderate; Tonka—high

Surface runoff: Cubden—slow; Tonka—negligible

Other properties: A high content of lime in the Cubden soil

Inclusions

Contrasting inclusions:

- The moderately well drained Brookings soils, which are not calcareous at or near the surface; on foot slopes
- The well drained Forman soils, which are not calcareous at or near the surface; on back slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Cubden—the high content of lime, which adversely affects the availability of plant nutrients, and wind erosion; Tonka—wetness

Management measures:

- In wet years these soils are better suited to late planted crops.
- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.
- Restricting grazing during wet periods helps to prevent surface compaction.
- Existing drainage systems should be maintained on the Tonka soil.
- Deferring tillage on the Tonka soil during wet periods helps to minimize surface compaction.

Interpretive Groups

Land capability classification: Cubden—Ile-4; Tonka—IVw-1

Range site: Cubden—Limy Subirrigated; Tonka—Wet Meadow

Windbreak suitability group: Cubden—1; Tonka—10

Pasture suitability group: Cubden—F; Tonka—B2

Dd—Divide loam

Composition

Divide and similar soils: 75 to 85 percent

Contrasting inclusions: 15 to 25 percent

Setting

Landform: Outwash plains

Landform position: Foot slopes

Slope range: 0 to 3 percent

Shape of areas: Irregular

Size of areas: 5 to 200 acres

Typical Profile

Surface layer:

0 to 9 inches—dark gray, calcareous loam

Subsoil:

9 to 18 inches—light brownish gray, calcareous clay loam

18 to 25 inches—light yellowish brown, mottled, calcareous clay loam

Underlying material:

25 to 60 inches—light yellowish brown, calcareous gravelly sand

Soil Properties and Qualities

Drainage class: Somewhat poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: 20 to 40 inches over gravelly material

Depth to seasonal high water table: 1.5 to 3.5 feet

Flooding: None

Ponding: None

Permeability: Moderate in the loamy sediments and rapid in the underlying gravelly material

Available water capacity: Moderate

Organic matter content: Moderate

Surface runoff: Slow

Other properties: A high content of lime

Inclusions

Contrasting inclusions:

- The well drained Fordville soils, which are not calcareous at or near the surface; on back slopes
- The poorly drained Marysland soils on toe slopes
- The somewhat excessively drained Renshaw soils, which are not calcareous at or near the surface and have gravelly material at a depth of 14 to 20 inches; on back slopes

Similar soils:

- Soils that do not have gravelly material within a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: The high content of lime, which adversely affects the availability of plant nutrients; the moderate available water capacity; wind erosion

Management measures:

- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.

Interpretive Groups

Land capability classification: IIIs-4

Range site: Limy Subirrigated

Windbreak suitability group: 1

Pasture suitability group: D1

Do—Dovray silty clay

Composition

Dovray and similar soils: 80 to 90 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Lake plains

Landform position: Toe slopes

Slope range: 0 to 1 percent

Shape of areas: Irregular

Size of areas: 5 to 100 acres

Typical Profile

Surface soil:

0 to 20 inches—dark gray silty clay

Subsoil:

20 to 46 inches—gray silty clay

Underlying material:

46 to 56 inches—light gray, calcareous silty clay loam

56 to 60 inches—light gray, mottled, calcareous loam

Soil Properties and Qualities

Drainage class: Very poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: 2.0 feet above to 0.5 foot below the surface

Flooding: None

Ponding: Frequent for very long periods

Permeability: Slow

Available water capacity: Moderate

Organic matter content: High

Surface runoff: Negligible

Inclusions

Contrasting inclusions:

- The poorly drained Colvin soils, which are calcareous at or near the surface; on toe slopes
- The somewhat poorly drained Hamerly soils, which have more sand and less clay than the Dovray soil and are calcareous at or near the surface; on foot slopes
- The somewhat poorly drained Lamoure soils, which have more silt and less clay than the Dovray soil and are calcareous at or near the surface; on low flood plains

Similar soils:

- Soils that are calcareous at the surface

Use and Management

Rangeland

Management concerns: Wetness

Management measures:

- Proper grazing management helps to maintain plant vigor.

Interpretive Groups

Land capability classification: Vw-4

Range site: Wetland

Windbreak suitability group: 10

Pasture suitability group: B2

EaA—Eckman very fine sandy loam, 0 to 2 percent slopes

Composition

Eckman and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Lake plains

Landform position: Summits and back slopes

Slope range: 0 to 2 percent

Shape of areas: Irregular

Size of areas: 5 to 40 acres

Typical Profile

Surface layer:

0 to 7 inches—dark grayish brown very fine sandy loam

Subsoil:

7 to 12 inches—grayish brown very fine sandy loam

12 to 31 inches—light brownish gray, calcareous silt loam

Underlying material:

31 to 60 inches—light gray and pale yellow, calcareous silt loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: Moderate
Surface runoff: Slow

Inclusions

Contrasting inclusions:
 • Embden soils, which have more sand than the Eckman soil; on foot slopes
Similar soils:
 • Soils that are dark to a depth of more than 16 inches

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat
Management concerns: Wind erosion
Management measures:
 • Minimizing tillage and leaving crop residue on the surface help to control erosion, conserve moisture, and maintain organic matter content and tilth.
 • Wind stripcropping and field windbreaks help to control wind erosion.

Interpretive Groups

Land capability classification: 11e-6
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

EbB—Eckman-Gardena very fine sandy loams, 2 to 6 percent slopes

Composition

Eckman and similar soils: 50 to 70 percent
 Gardena and similar soils: 30 to 45 percent
 Contrasting inclusions: 5 to 15 percent

Setting

Landform: Lake plains
Landform position: Eckman—summits and back slopes; Gardena—foot slopes
Slope range: Eckman—2 to 6 percent; Gardena—2 to 3 percent
Shape of areas: Irregular
Size of areas: 0 to 10 acres

Typical Profile

Eckman

Surface layer:
 0 to 7 inches—dark grayish brown very fine sandy loam
Subsoil:
 7 to 12 inches—grayish brown very fine sandy loam
 12 to 31 inches—light brownish gray, calcareous silt loam
Underlying material:
 31 to 60 inches—light gray and pale yellow, calcareous silt loam

Gardena

Surface soil:
 0 to 20 inches—dark gray very fine sandy loam
Subsoil:
 20 to 34 inches—grayish brown silt loam
 34 to 44 inches—light gray, calcareous silt loam
Underlying material:
 44 to 60 inches—light gray, calcareous silt loam

Soil Properties and Qualities

Drainage class: Eckman—well drained; Gardena—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: Eckman—more than 6 feet; Gardena—3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: Eckman—moderate; Gardena—high
Surface runoff: Eckman—medium; Gardena—slow

Inclusions

Contrasting inclusions:
 • The well drained Zell soils, which are calcareous at or near the surface; on shoulder slopes
 • The somewhat poorly drained Bearden soils, which are calcareous at or near the surface; on foot slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat
Management concerns: Wind erosion and water erosion
Management measures:
 • Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
 • Contour farming and grassed waterways help to control water erosion.

- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: Eckman—Ile-1; Gardena—Ile-6

Range site: Eckman—Silty; Gardena—Silty

Windbreak suitability group: Eckman—3; Gardena—1

Pasture suitability group: Eckman—F; Gardena—K

EcB—Eckman-Zell very fine sandy loams, 1 to 6 percent slopes

Composition

Eckman and similar soils: 60 to 70 percent

Zell and similar soils: 20 to 30 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Lake plains

Landform position: Eckman—summits and back slopes; Zell—shoulder slopes

Slope range: Eckman—1 to 6 percent; Zell—2 to 6 percent

Shape of areas: Irregular

Size of areas: 0 to 10 acres

Typical Profile

Eckman

Surface layer:

0 to 7 inches—dark grayish brown very fine sandy loam

Subsoil:

7 to 12 inches—grayish brown very fine sandy loam

12 to 31 inches—light brownish gray, calcareous silt loam

Underlying material:

31 to 60 inches—light gray and pale yellow, calcareous silt loam

Zell

Surface layer:

0 to 7 inches—dark gray, calcareous very fine sandy loam

Subsoil:

7 to 23 inches—light gray, calcareous silt loam

Underlying material:

23 to 50 inches—pale yellow and light brownish gray, calcareous, varved silt loam and very fine sandy loam

50 to 60 inches—light gray, calcareous, varved silt loam

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Moderate

Available water capacity: High

Organic matter content: Eckman—moderate; Zell—moderately low

Surface runoff: Medium

Other properties: A high content of lime in the Zell soil

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Bearden soils, which are calcareous at or near the surface; on foot slopes

Similar soils:

- Soils that are dark to a depth of more than 16 inches

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Wind erosion and water erosion; the high content of lime in the Zell soil, which adversely affects the availability of plant nutrients

Management measures:

- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming and grassed waterways help to control water erosion.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: Eckman—Ile-1; Zell—Ive-2

Range site: Eckman—Silty; Zell—Thin Upland

Windbreak suitability group: Eckman—3; Zell—8

Pasture suitability group: Eckman—F; Zell—G

EdC—Edgeley loam, 4 to 9 percent slopes

Composition

Edgeley and similar soils: 80 to 90 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Moraines

Landform position: Back slopes

Slope range: 4 to 9 percent

Shape of areas: Irregular

Size of areas: 10 to 100 acres

Typical Profile

Surface layer:

0 to 5 inches—dark gray loam

Subsoil:

5 to 19 inches—dark gray and grayish brown clay loam

19 to 30 inches—light brownish gray, calcareous clay loam

Underlying material:

30 to 60 inches—gray, calcareous shale

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Moderately deep

Depth to contrasting layer: 20 to 40 inches over shale

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Moderate in the loamy sediments and very slow in the underlying shale

Available water capacity: Moderate

Organic matter content: Moderate

Surface runoff: Rapid

Inclusions

Contrasting inclusions:

- The moderately well drained Aastad soils, which are not underlain by shale; on foot slopes
- The well drained Buse soils, which are not underlain by shale; on shoulder slopes
- The well drained Klotten soils, which have shale within a depth of 20 inches; on back slopes
- The well drained Kranzburg soils, which are not underlain by shale; on back slopes

Similar soils:

- Soils that do not have shale within a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Water erosion

Management measures:

- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming, terraces, and grassed waterways help to control water erosion, but the slopes in some areas are too short or too irregular for contour farming and terraces.

- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: IIIe-1

Range site: Silty

Windbreak suitability group: 6

Pasture suitability group: F

EgB—Egeland-Embsen complex, 2 to 6 percent slopes

Composition

Egeland and similar soils: 55 to 65 percent

Embsen and similar soils: 25 to 35 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains

Landform position: Egeland—summits and back slopes; Embsen—foot slopes

Slope range: 2 to 6 percent

Shape of areas: Irregular

Size of areas: 5 to 50 acres

Typical Profile

Egeland

Surface layer:

0 to 8 inches—very dark gray sandy loam

Subsoil:

8 to 30 inches—dark brown and brown sandy loam

30 to 36 inches—pale brown loamy sand

36 to 46 inches—pale brown, calcareous loamy sand

Underlying material:

46 to 60 inches—very pale brown, calcareous loamy sand

Embsen

Surface layer:

0 to 9 inches—dark gray fine sandy loam

Subsoil:

9 to 24 inches—dark gray fine sandy loam

24 to 34 inches—grayish brown sandy loam

34 to 42 inches—grayish brown, calcareous sandy loam

42 to 51 inches—light yellowish brown, mottled, calcareous very fine sandy loam

Underlying material:

51 to 60 inches—light brownish gray, mottled, calcareous very fine sandy loam

Soil Properties and Qualities

Drainage class: Egeland—well drained; Embsen—moderately well drained

Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: Egeland—more than 6 feet; Embden—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderately rapid
Available water capacity: Moderate
Organic matter content: Egeland—moderate; Embden—high
Surface runoff: Slow

Inclusions

Contrasting inclusions:

- The somewhat excessively drained Arvilla soils, which have more sand in the surface layer than the major soils and have gravelly material at a depth of 14 to 25 inches; on back slopes
- The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on back slopes
- The well drained Poinsett soils, which have less sand and more clay than the major soils; on back slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Egeland—wind erosion and water erosion, low available water capacity; Embden—wind erosion and water erosion, moderate available water capacity

Management measures:

- These soils are better suited to early maturing crops, such as small grain.
- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: Egeland—IIIe-7; Embden—IIIe-7

Range site: Egeland—Sandy; Embden—Sandy

Windbreak suitability group: Egeland—5; Embden—1

Pasture suitability group: Egeland—H; Embden—H

En—Exline-Aberdeen-Nahon silt loams

Composition

Exline and similar soils: 35 to 50 percent
 Aberdeen and similar soils: 15 to 35 percent

Nahon and similar soils: 15 to 35 percent
 Contrasting inclusions: 5 to 15 percent

Setting

Landform: Lake plains

Landform position: Exline—the lower foot slopes;

Aberdeen—summits and back slopes; Nahon—foot slopes

Slope range: 0 to 2 percent

Shape of areas: Irregular

Size of areas: 10 to 200 acres

Typical Profile

Exline

Surface layer:

0 to 2 inches—gray silt loam

Subsoil:

2 to 7 inches—dark gray and gray silty clay

7 to 18 inches—dark gray silty clay with nests of salt

18 to 26 inches—dark gray, calcareous silty clay with nests of salt

26 to 37 inches—light brownish gray, calcareous silty clay loam with nests of salt

Underlying material:

37 to 60 inches—light gray and white, calcareous, varved silty clay loam

Aberdeen

Surface layer:

0 to 8 inches—dark gray silt loam

Transitional layer:

8 to 12 inches—dark gray and gray silt loam

Subsoil:

12 to 37 inches—dark gray and grayish brown silty clay

37 to 45 inches—light brownish gray, calcareous silty clay with nests of gypsum and other salts.

Underlying material:

45 to 53 inches—light gray, calcareous silty clay loam

53 to 60 inches—light gray, mottled, calcareous, varved silty clay loam

Nahon

Surface layer:

0 to 7 inches—dark gray silt loam

Subsurface layer:

7 to 8 inches—gray silt loam

Subsoil:

8 to 19 inches—dark gray silty clay

19 to 31 inches—dark gray and light brownish gray silty clay with nests of salt

31 to 40 inches—light brownish gray, calcareous silty clay loam with nests of salt

Underlying material:

40 to 55 inches—light gray, calcareous silty clay loam

55 to 60 inches—white and pale yellow, calcareous, varved silty clay loam

Soil Properties and Qualities

Drainage class: Exline—somewhat poorly drained;

Aberdeen—moderately well drained; Nahon—moderately well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: Exline—1.5 to 3.5 feet; Aberdeen—3.5 to 5.0 feet; Nahon—3.5 to 5.0 feet

Flooding: None

Ponding: None

Permeability: Exline—very slow; Aberdeen—slow; Nahon—very slow

Available water capacity: Exline—moderate; Aberdeen—high; Nahon—moderate

Organic matter content: Exline—moderately low; Aberdeen—moderate; Nahon—moderate

Surface runoff: Slow

Other properties: A sodium-affected subsoil in all three soils

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Bearden soils, which have less clay than the major soils and do not have a sodium-affected subsoil; on foot slopes
- The moderately well drained Harmony soils, which do not have a sodium-affected subsoil; on summits and back slopes

Use and Management

Cropland and pasture

Main crops: Exline—generally not suited to crops; Aberdeen and Nahon—alfalfa, barley, oats, and wheat

Management concerns: The sodium-affected subsoil, which adversely affect crop growth by restricting the penetration of plant roots; a slow rate of water infiltration

Management measures:

- Proper grazing management helps to maintain plant vigor and conserves moisture.
- Cultivated areas should be seeded to adapted grasses.

Interpretive Groups

Land capability classification: Exline—VIs-1; Aberdeen—IIIs-1; Nahon—IVs-2

Range site: Exline—Thin Claypan; Aberdeen—Clayey; Nahon—Claypan

Windbreak suitability group: Exline—10; Aberdeen—4; Nahon—9

Pasture suitability group: Exline—NS; Aberdeen—E; Nahon—C

Ep—Exline-Putney silt loams, 1 to 4 percent slopes

Composition

Exline and similar soils: 35 to 55 percent

Putney and similar soils: 30 to 45 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Lake plains

Landform position: Exline—foot slopes; Putney—summits and back slopes

Slope range: Exline—1 to 3 percent; Putney—2 to 4 percent

Shape of areas: Irregular

Size of areas: 5 to 100 acres

Typical Profile

Exline

Surface layer:

0 to 2 inches—gray silt loam

Subsoil:

2 to 7 inches—dark gray and gray silty clay

7 to 18 inches—dark gray silty clay with nests of salt

18 to 26 inches—dark gray, calcareous silty clay with nests of salt

26 to 37 inches—light brownish gray, calcareous silty clay loam with nests of salt

Underlying material:

37 to 60 inches—light gray and white, calcareous, varved silty clay loam

Putney

Surface layer:

0 to 8 inches—dark gray silt loam

Subsoil:

8 to 15 inches—dark grayish brown silt loam

15 to 25 inches—light gray and pale yellow, calcareous silt loam with nests of gypsum and other salts

Underlying material:

25 to 38 inches—pale yellow, calcareous silt loam

38 to 60 inches—pale yellow, calcareous, varved silt loam

Soil Properties and Qualities

Drainage class: Exline—moderately well drained; Putney—well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: Exline—3.5 to 5.0

feet; Putney—more than 6 feet

Flooding: None

Ponding: None

Permeability: Exline—very slow; Putney—moderate in the upper part and moderate to slow in the lower part

Available water capacity: Exline—moderate; Putney—high

Organic matter content: Exline—moderately low; Putney—moderate

Surface runoff: Slow

Other properties: A sodium-affected subsoil in the Exline soil

Inclusions

Contrasting inclusions:

- The moderately well drained Aberdeen soils, which have salts at a depth of more than 16 inches; on the upper foot slopes
- The well drained Great Bend soils, which have salts at a depth of more than 20 inches; on back slopes
- The moderately well drained Nahon soils, which have salts at a depth of more than 16 inches; on foot slopes

Use and Management

Cropland and pasture

Main crops: Exline—generally not suited to crops; Putney—alfalfa, barley, oats, and wheat

Management concerns: Exline—the sodium-affected subsoil, which adversely affects crop growth by restricting the penetration of plant roots, and a slow rate of water infiltration; Putney—high salt content

Management measures:

- Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system conserve moisture and maintain organic matter content and tilth.
- Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.
- Cultivated areas should be seeded to adapted grasses.

Interpretive Groups

Land capability classification: Exline—VIs-1; Putney—Ile-5

Range site: Exline—Thin Claypan; Putney—Silty

Windbreak suitability group: Exline—10; Putney—3

Pasture suitability group: Exline—NS; Putney—F

Fd—Fordville loam, 0 to 2 percent slopes

Composition

Fordville and similar soils: 80 to 90 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Outwash plains

Landform position: Summits and back slopes

Slope range: 0 to 2 percent

Shape of areas: Irregular

Size of areas: 5 to 100 acres

Typical Profile

Surface layer:

0 to 9 inches—very dark gray loam

Subsoil:

9 to 29 inches—very dark grayish brown and dark brown loam

Underlying material:

29 to 33 inches—light brownish gray, calcareous gravelly loamy sand

33 to 60 inches—pale brown, calcareous gravelly sand

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Very deep

Depth to contrasting layer: 20 to 40 inches over gravelly material

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Moderate in the loamy sediments and rapid in the underlying gravelly material

Available water capacity: Moderate

Organic matter content: High

Surface runoff: Slow

Inclusions

Contrasting inclusions:

- The moderately well drained Divide soils, which are calcareous at or near the surface; on foot slopes
- The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on back slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Moderate available water capacity

Management measures:

- This soil is better suited to early maturing crops, such as small grain.
- Minimizing tillage and leaving crop residue on the surface conserve moisture.
- Including grasses and legumes in the rotation helps to maintain organic matter content and tilth.
- Irrigation helps to overcome the limited water storage

capacity if water is of adequate quantity and quality.

Interpretive Groups

Land capability classification: IIs-3

Range site: Silty

Windbreak suitability group: 6

Pasture suitability group: D1

FmA—Forman-Aastad loams, 0 to 3 percent slopes

Composition

Forman and similar soils: 40 to 55 percent

Aastad and similar soils: 35 to 50 percent

Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains

Landform position: Forman—summits and back slopes;
Aastad—foot slopes

Slope range: Forman—0 to 3 percent; Aastad—0 to 2 percent

Shape of areas: Irregular

Size of areas: 5 to 200 acres

Typical Profile

Forman

Surface layer:

0 to 8 inches—very dark gray loam

Subsoil:

8 to 15 inches—brown clay loam

15 to 28 inches—light brownish gray, calcareous clay loam

Underlying material:

28 to 60 inches—light yellowish brown, calcareous clay loam

Aastad

Surface soil:

0 to 14 inches—very dark gray loam

Subsoil:

14 to 29 inches—dark grayish brown and light olive brown clay loam

29 to 38 inches—light yellowish brown, mottled, calcareous clay loam

Underlying material:

38 to 60 inches—olive yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Forman—well drained; Aastad—moderately well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: Forman—more than 6 feet; Aastad—2.5 to 4.0 feet

Flooding: None

Ponding: None

Permeability: Moderately slow

Available water capacity: High

Organic matter content: High

Surface runoff: Slow

Other properties: Runoff water flows over the Aastad soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:

- The well drained Buse soils, which are calcareous at or near the surface; on shoulder slopes
- The very poorly drained Parnell soils in basins

Similar soils:

- Soils that have more silt and less sand
- Soils that have less clay in the subsoil than the Forman soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Slight

Management measures:

- Managing crop residue conserves moisture and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: Forman—I-2; Aastad—I-3

Range site: Forman—Silty; Aastad—Loamy Overflow

Windbreak suitability group: Forman—3; Aastad—1

Pasture suitability group: Forman—F; Aastad—K

FmB—Forman-Aastad loams, 1 to 6 percent slopes

Composition

Forman and similar soils: 50 to 65 percent

Aastad and similar soils: 25 to 40 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains

Landform position: Forman—summits and back slopes;
Aastad—foot slopes

Slope range: Forman—2 to 6 percent; Aastad—1 to 2 percent

Shape of areas: Irregular

Size of areas: 5 to 500 acres

Typical Profile

Forman

Surface layer:

0 to 8 inches—very dark gray loam

Subsoil:

8 to 15 inches—brown clay loam

15 to 28 inches—light brownish gray, calcareous clay loam

Underlying material:

28 to 60 inches—light yellowish brown, calcareous clay loam

Aastad

Surface soil:

0 to 14 inches—very dark gray loam

Subsoil:

14 to 29 inches—dark grayish brown and light olive brown clay loam

29 to 38 inches—light yellowish brown, mottled, calcareous clay loam

Underlying material:

38 to 60 inches—olive yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Forman—well drained; Aastad—moderately well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: Forman—more than 6 feet; Aastad—2.5 to 4.0 feet

Flooding: None

Ponding: None

Permeability: Moderately slow

Available water capacity: High

Organic matter content: High

Surface runoff: Forman—medium; Aastad—slow

Other properties: Runoff water flows over the Aastad soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:

- The well drained Buse soils, which are calcareous at or near the surface; on shoulder slopes
- The very poorly drained Parnell soils in basins

Similar soils:

- Soils that have less clay in the subsoil than the Forman soil
- Soils that have more silt and less sand

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Water erosion

Management measures:

- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming and terraces.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: Forman—Ile-2; Aastad—I-3

Range site: Forman—Silty; Aastad—Loamy Overflow

Windbreak suitability group: Forman—3; Aastad—1

Pasture suitability group: Forman—F; Aastad—K

FnB—Forman-Aastad-Parnell complex, 0 to 6 percent slopes

Composition

Forman and similar soils: 35 to 50 percent

Aastad and similar soils: 20 to 35 percent

Parnell and similar soils: 15 to 30 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains

Landform position: Forman—summits and back slopes; Aastad—foot slopes; Parnell—basins

Slope range: Forman—2 to 6 percent; Aastad—1 to 2 percent; Parnell—0 to 1 percent

Shape of areas: Irregular

Size of areas: 10 to 200 acres

Typical Profile

Forman

Surface layer:

0 to 8 inches—very dark gray loam

Subsoil:

8 to 15 inches—brown clay loam

15 to 28 inches—light brownish gray, calcareous clay loam

Underlying material:

28 to 60 inches—light yellowish brown, calcareous clay loam

Aastad

Surface soil:

0 to 14 inches—very dark gray loam

Subsoil:

14 to 29 inches—dark grayish brown and light olive brown clay loam

29 to 38 inches—light yellowish brown, mottled, calcareous clay loam

Underlying material:

38 to 60 inches—olive yellow, mottled, calcareous clay loam

Parnell

Surface soil:

0 to 17 inches—dark gray silty clay loam

Subsoil:

17 to 38 inches—dark gray silty clay

Underlying material:

38 to 47 inches—dark gray, calcareous clay

47 to 60 inches—light gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Forman—well drained; Aastad—moderately well drained; Parnell—very poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: Forman—at a depth of more than 6 feet; Aastad—at a depth of 2.5 to 4.0 feet; Parnell—1.0 foot above to 0.5 foot below the surface

Flooding: None

Ponding: Forman—none; Aastad—none; Parnell—frequent for very long periods

Permeability: Forman—moderately slow; Aastad—moderately slow; Parnell—slow

Available water capacity: High

Organic matter content: High

Surface runoff: Forman—medium; Aastad—slow; Parnell—negligible

Other properties: Runoff water flows over the Aastad soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:

- The well drained Buse soils, which are calcareous at or near the surface; on shoulder slopes
- The somewhat poorly drained Hamerly soils, which are calcareous at or near the surface; on foot slopes
- The poorly drained Vallery soils, which are calcareous at or near the surface; on toe slopes

Similar soils:

- Soils that have more silt and less sand than the Forman and Aastad soils
- Soils that have less clay in the subsoil than the Forman soil
- Calcareous soils in basins

Use and Management

Cropland

Main crops: Forman and Aastad—alfalfa, barley, corn, oats, soybeans, and wheat; Parnell—generally not suited to crops

Management concerns: Forman—water erosion; Parnell—wetness

Management measures:

- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content and tilth.
- Existing drainage systems should be maintained on the Parnell soil.
- Deferring tillage in areas of the Parnell soil during wet periods helps to minimize surface compaction.

Interpretive Groups

Land capability classification: Forman—Ile-2; Aastad—I-3; Parnell—Vw-2

Range site: Forman—Silty; Aastad—Loamy Overflow; Parnell—Shallow Marsh

Windbreak suitability group: Forman—3; Aastad—1; Parnell—10

Pasture suitability group: Forman—F; Aastad—K; Parnell—B2

FoB—Forman-Buse-Aastad loams, 1 to 6 percent slopes

Composition

Forman and similar soils: 35 to 50 percent

Buse and similar soils: 25 to 35 percent

Aastad and similar soils: 15 to 25 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains

Landform position: Forman—summits and back slopes; Buse—shoulder slopes; Aastad—foot slopes

Slope range: Forman—2 to 6 percent; Buse—3 to 6 percent; Aastad—1 to 2 percent

Shape of areas: Irregular

Size of areas: 5 to 900 acres

Typical Profile

Forman

Surface layer:

0 to 8 inches—very dark gray loam

Subsoil:

8 to 15 inches—brown clay loam

15 to 28 inches—light brownish gray, calcareous clay loam

Underlying material:

28 to 60 inches—light yellowish brown, calcareous clay loam

Buse*Surface layer:*

0 to 7 inches—dark grayish brown, calcareous loam

Subsoil:

7 to 22 inches—light yellowish brown, calcareous clay loam

Underlying material:

22 to 60 inches—light yellowish brown, calcareous clay loam

Aastad*Surface soil:*

0 to 14 inches—very dark gray loam

Subsoil:

14 to 29 inches—dark grayish brown and light olive brown clay loam

29 to 38 inches—light yellowish brown, mottled, calcareous clay loam

Underlying material:

38 to 60 inches—olive yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Forman—well drained; Buse—well drained; Aastad—moderately well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: Forman—more than 6 feet; Buse—more than 6 feet; Aastad—2.5 to 4.0 feet

Flooding: None

Ponding: None

Permeability: Moderately slow

Available water capacity: High

Organic matter content: Forman—high; Buse—moderately low; Aastad—high

Surface runoff: Forman—medium; Buse—medium; Aastad—slow

Other properties: The Buse soil has a high content of lime. Runoff water flows over the Aastad soil during periods of rainfall or snowmelt.

Inclusions*Contrasting inclusions:*

- The well drained Kranzburg soils, which have less sand and more silt in the surface layer and subsoil than the major soils; on back slopes

- The moderately well drained La Prairie soils, which formed in alluvium; on high flood plains
- The very poorly drained Parnell soils, which are dark to a depth of more than 24 inches; in basins

Similar soils:

- Soils that have less clay in the subsoil than the Forman soil
- Soils that have a thinner surface layer than the Buse soil

Use and Management**Cropland**

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Forman—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients

Management measures:

- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.

Interpretive Groups

Land capability classification: Forman—Ile-2; Buse—IIIe-6; Aastad—I-3

Range site: Forman—Silty; Buse—Thin Upland; Aastad—Loamy Overflow

Windbreak suitability group: Forman—3; Buse—8; Aastad—1

Pasture suitability group: Forman—F; Buse—G; Aastad—K

FoC—Forman-Buse-Aastad loams, 2 to 9 percent slopes**Composition**

Forman and similar soils: 35 to 50 percent

Buse and similar soils: 25 to 45 percent

Aastad and similar soils: 15 to 25 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines

Landform position: Forman—back slopes; Buse—shoulder slopes; Aastad—foot slopes

Slope range: Forman—6 to 9 percent; Buse—6 to 9

percent; Aastad—2 to 6 percent

Shape of areas: Irregular

Size of areas: 10 to 1,000 acres

Typical Profile

Forman

Surface layer:

0 to 8 inches—very dark gray loam

Subsoil:

8 to 15 inches—brown clay loam

15 to 28 inches—light brownish gray, calcareous clay loam

Underlying material:

28 to 60 inches—light yellowish brown, calcareous clay loam

Buse

Surface layer:

0 to 7 inches—dark grayish brown, calcareous loam

Subsoil:

7 to 22 inches—light yellowish brown, calcareous clay loam

Underlying material:

22 to 60 inches—light yellowish brown, calcareous clay loam

Aastad

Surface soil:

0 to 14 inches—very dark gray loam

Subsoil:

14 to 29 inches—dark grayish brown and light olive brown clay loam

29 to 38 inches—light yellowish brown, mottled, calcareous clay loam

Underlying material:

38 to 60 inches—olive yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Forman—well drained; Buse—well drained; Aastad—moderately well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: Forman—more than 6 feet; Buse—more than 6 feet; Aastad—2.5 to 4.0 feet

Flooding: None

Ponding: None

Permeability: Moderately slow

Available water capacity: High

Organic matter content: Forman—high; Buse—moderately low; Aastad—high

Surface runoff: Medium

Other properties: The Buse soil has a high content of

lime. Runoff water flows over the Aastad soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Hamerly soils on foot slopes
- The moderately well drained La Prairie soils, which formed in alluvium; on high flood plains
- The very poorly drained Parnell soils in basins

Similar soils:

- Soils that have less clay in the subsoil than the Forman soil
- Soils that have a thinner surface layer than the Buse soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Forman—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients

Management measures:

- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming and terraces.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.

Interpretive Groups

Land capability classification: Forman—IIIe-1; Buse—IVe-2; Aastad—Ile-1

Range site: Forman—Silty; Buse—Thin Upland; Aastad—Silty

Windbreak suitability group: Forman—3; Buse—8; Aastad—1

Pasture suitability group: Forman—F; Buse—G; Aastad—F

FpB—Forman-Buse-Parnell complex, 0 to 6 percent slopes

Composition

Forman and similar soils: 35 to 50 percent

Buse and similar soils: 25 to 35 percent

Parnell and similar soils: 15 to 25 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains

Landform position: Forman—summits and back slopes;

Buse—shoulder slopes; Parnell—basins

Slope range: Forman—2 to 6 percent; Buse—3 to 6 percent; Parnell—0 to 1 percent

Shape of areas: Irregular

Size of areas: 10 to 300 acres

Typical Profile

Forman

Surface layer:

0 to 8 inches—very dark gray loam

Subsoil:

8 to 15 inches—brown clay loam

15 to 28 inches—light brownish gray, calcareous clay loam

Underlying material:

28 to 60 inches—light yellowish brown, calcareous clay loam

Buse

Surface layer:

0 to 7 inches—dark grayish brown, calcareous loam

Subsoil:

7 to 22 inches—light yellowish brown, calcareous clay loam

Underlying material:

22 to 60 inches—light yellowish brown, calcareous clay loam

Parnell

Surface soil:

0 to 17 inches—dark gray silty clay loam

Subsoil:

17 to 38 inches—dark gray silty clay

Underlying material:

38 to 47 inches—dark gray, calcareous clay

47 to 60 inches—light gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class Forman—well drained; Buse—well drained; Parnell—very poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: Forman—at a depth of more than 6 feet; Buse—at a depth of more than 6 feet; Parnell—1.0 foot above to 0.5 foot below the surface

Flooding: None

Ponding: Forman—none; Buse—none; Parnell—

frequent for very long periods

Permeability: Forman—moderately slow; Buse—moderately slow; Parnell—slow

Available water capacity: High

Organic matter content: Forman—high; Buse—moderately low; Parnell—high

Surface runoff: Forman—medium; Buse—medium; Parnell—negligible

Other properties: A high content of lime in the Buse soil

Inclusions

Contrasting inclusions:

- The moderately well drained Aastad soils on foot slopes
- The somewhat poorly drained Hamerly soils on foot slopes

Similar soils:

- Soils that have less clay in the subsoil than the Forman soil
- Soils that have a thinner surface layer than the Buse soil
- Calcareous soils in basins

Use and Management

Cropland

Main crops: Forman and Buse—alfalfa, barley, corn, oats, soybeans, and wheat; Parnell—generally not suited to crops

Management concerns: Forman—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Parnell—wetness

Management measures:

- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.
- Existing drainage systems should be maintained on the Parnell soil.
- Deferring tillage in areas of the Parnell soil during wet periods helps to minimize surface compaction.

Interpretive Groups

Land capability classification: Forman—Ile-2; Buse—Ile-6; Parnell—Vw-2

Range site: Forman—Silty; Buse—Thin Upland; Parnell—Shallow Marsh

Windbreak suitability group: Forman—3; Buse—8; Parnell—10

Pasture suitability group: Forman—F; Buse—G;
Parnell—B2

FpC—Forman-Buse-Parnell complex, 0 to 9 percent slopes

Composition

Forman and similar soils: 35 to 50 percent

Buse and similar soils: 25 to 35 percent

Parnell and similar soils: 15 to 25 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines

Landform position: Forman—back slopes; Buse—shoulder slopes; Parnell—basins

Slope range: Forman—2 to 9 percent; Buse—3 to 9 percent; Parnell—0 to 1 percent

Shape of areas: Irregular

Size of areas: 5 to 200 acres

Typical Profile

Forman

Surface layer:

0 to 8 inches—very dark gray loam

Subsoil:

8 to 15 inches—brown clay loam

15 to 28 inches—light brownish gray, calcareous clay loam

Underlying material:

28 to 60 inches—light yellowish brown, calcareous clay loam

Buse

Surface layer:

0 to 7 inches—dark grayish brown, calcareous loam

Subsoil:

7 to 22 inches—light yellowish brown, calcareous clay loam

Underlying material:

22 to 60 inches—light yellowish brown, calcareous clay loam

Parnell

Surface soil:

0 to 17 inches—dark gray silty clay loam

Subsoil:

17 to 38 inches—dark gray silty clay

Underlying material:

38 to 47 inches—dark gray, calcareous clay

47 to 60 inches—light gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Forman—well drained; Buse—well drained; Parnell—very poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: Forman—at a depth of more than 6 feet; Buse—at a depth of more than 6 feet; Parnell—1.0 foot above to 0.5 foot below the surface

Flooding: None

Ponding: Forman—none; Buse—none; Parnell—frequent for very long periods

Permeability: Forman—moderately slow; Buse—moderately slow; Parnell—slow

Available water capacity: High

Organic matter content: Forman—high; Buse—moderately low; Parnell—high

Surface runoff: Forman—medium; Buse—medium; Parnell—negligible

Other properties: A high content of lime in the Buse soil

Inclusions

Contrasting inclusions:

- The moderately well drained Aastad soils on foot slopes
- The somewhat poorly drained Hamerly soils on foot slopes
- The poorly drained Vallers soils on toe slopes

Similar soils:

- Soils that have less clay in the subsoil than the Forman soil
- Soils that have a thinner surface layer than the Buse soil
- Calcareous soils in basins

Use and Management

Cropland

Main crops: Forman and Buse—alfalfa, barley, corn, oats, soybeans, and wheat; Parnell—generally not suited to crops

Management concerns: Forman—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Parnell—wetness

Management measures:

- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming, terraces, and grassed waterways help to control water erosion, but the slopes in most areas are too short or too irregular for contour farming and terraces.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to

control erosion and maintains organic matter content, fertility, and tilth.

- Existing drainage systems should be maintained on the Parnell soil.
- Deferring tillage in areas of the Parnell soil during wet periods helps to minimize surface compaction.

Interpretive Groups

Land capability classification: Forman—IIIe-1; Buse—IVe-2; Parnell—Vw-2

Range site: Forman—Silty; Buse—Thin Upland; Parnell—Shallow Marsh

Windbreak suitability group: Forman—3; Buse—8; Parnell—10

Pasture suitability group: Forman—F; Buse—G; Parnell—B2

Gb—Great Bend silt loam, 0 to 2 percent slopes

Composition

Great Bend and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Lake plains

Landform position: Summits and back slopes

Slope range: 0 to 2 percent

Shape of areas: Irregular

Size of areas: 10 to 150 acres

Typical Profile

Surface layer:

0 to 7 inches—dark gray silt loam

Subsoil:

7 to 17 inches—grayish brown and pale brown silt loam

17 to 30 inches—pale yellow, calcareous silt loam

Underlying material:

30 to 52 inches—light gray, calcareous, varved silt loam

52 to 60 inches—light brownish gray, calcareous very fine sandy loam

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Moderate in the upper part, moderate to slow in the lower part

Available water capacity: High

Organic matter content: Moderate

Surface runoff: Slow

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Bearden soils, which are calcareous at or near the surface; on foot slopes
- The moderately well drained Harmony soils, which have less silt and more clay in the subsoil than the Great Bend soil; on foot slopes

Similar soils:

- Soils that have gypsum and other salts within a depth of 20 inches

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Few limitations

Management measures:

- Measures that conserve moisture are needed.
- Managing crop residue conserves moisture and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: IIc-2

Range site: Silty

Windbreak suitability group: 3

Pasture suitability group: F

Gp—Great Bend-Putney silt loams, 0 to 2 percent slopes

Composition

Great Bend and similar soils: 40 to 55 percent

Putney and similar soils: 30 to 40 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Lake plains

Landform position: Great Bend—summits and back slopes; Putney—back slopes

Slope range: 0 to 2 percent

Shape of areas: Irregular

Size of areas: 10 to 200 acres

Typical Profile

Great Bend

Surface layer:

0 to 7 inches—dark gray silt loam

Subsoil:

7 to 17 inches—grayish brown and pale brown silt loam

17 to 30 inches—pale yellow, calcareous silt loam

Underlying material:

30 to 52 inches—light gray, calcareous, varved silt loam

52 to 60 inches—light brownish gray, calcareous very fine sandy loam

Putney

Surface layer:

0 to 8 inches—dark gray silt loam

Subsoil:

8 to 15 inches—dark grayish brown silt loam

15 to 25 inches—light gray and pale yellow, calcareous silt loam with nests of gypsum and other salts

Underlying material:

25 to 38 inches—pale yellow, calcareous silt loam

38 to 60 inches—pale yellow, calcareous, varved silt loam

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Moderate in the upper part, moderate to slow in the lower part

Available water capacity: High

Organic matter content: Moderate

Surface runoff: Slow

Other properties: The Putney soil has soluble salts below a depth of 15 inches.

Inclusions

Contrasting inclusions:

- The moderately well drained Aberdeen soils, which have a sodium-affected subsoil; on the lower foot slopes
- The somewhat poorly drained Bearden soils, which are calcareous at or near the surface; on foot slopes
- The moderately well drained Harmony soils, which have more clay in the subsoil than the major soils; on the upper foot slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Great Bend—few limitations; Putney—high content of salt

Management measures:

- Measures that conserve moisture are needed in areas of the Great Bend soil.
- Minimizing tillage and leaving crop residue on the surface conserve moisture and maintain organic matter content and tilth.
- Including grasses and legumes in the rotation helps to maintain organic matter content, fertility, and tilth.

- Salt-tolerant crops should be planted.

Interpretive Groups

Land capability classification: Great Bend—IIC-2; Putney—IIs-3

Range site: Great Bend—Silty; Putney—Silty

Windbreak suitability group: Great Bend—3; Putney—3

Pasture suitability group: Great Bend—F; Putney—F

GzC—Great Bend-Zell-Huffton silt loams, 4 to 9 percent slopes

Composition

Great Bend and similar soils: 30 to 40 percent

Zell and similar soils: 20 to 35 percent

Huffton and similar soils: 15 to 25 percent

Contrasting inclusions: 5 to 20 percent

Setting

Landform: Lake plains

Landform position: Great Bend—back slopes; Zell—shoulder slopes; Huffton—shoulder slopes

Slope range: Great Bend—4 to 9 percent; Zell—6 to 9 percent; Huffton—6 to 9 percent

Shape of areas: Irregular

Size of areas: 5 to 50 acres

Typical Profile

Great Bend

Surface layer:

0 to 7 inches—dark gray silt loam

Subsoil:

7 to 17 inches—grayish brown and pale brown silt loam

17 to 30 inches—pale yellow, calcareous silt loam

Underlying material:

30 to 52 inches—light gray, calcareous, varved silt loam

52 to 60 inches—light brownish gray, calcareous very fine sandy loam

Zell

Surface layer:

0 to 7 inches—dark gray, calcareous silt loam

Subsoil:

7 to 23 inches—light gray, calcareous silt loam

Underlying material:

23 to 50 inches—pale yellow and light brownish gray, calcareous, varved silt loam and very fine sandy loam

50 to 60 inches—light gray, calcareous, varved silt loam

Huffton

Surface layer:

0 to 7 inches—dark grayish brown, calcareous silt loam

Subsoil:

7 to 25 inches—light gray and pale yellow, calcareous silt loam with nests of salt

Underlying material:

25 to 35 inches—pale yellow, calcareous, varved silt loam with nests of salt

35 to 60 inches—pale yellow and gray, calcareous, varved silt loam

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Great Bend—moderate in the upper part, moderate to slow in the lower part; Zell—moderate; Huffton—moderate in the upper part, moderate to slow in the lower part

Available water capacity: Great Bend—high; Zell—high; Huffton—moderate

Organic matter content: Great Bend—moderate; Zell—moderately low; Huffton—moderately low

Surface runoff: Medium

Other properties: A high content of lime in the Zell and Huffton soils; moderate salinity in the Huffton soil

Inclusions*Contrasting inclusions:*

- The well drained Beotia soils, which are dark to a depth of more than 16 inches; on foot slopes
- The somewhat poorly drained Bearden soils on the lower foot slopes

Similar soils:

- Soils that have more clay and less silt and very fine sand than the Great Bend soil

Use and Management**Cropland**

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Great Bend—water erosion; Zell—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Huffton—wind erosion, water erosion, the high content of lime, which adversely affects the availability of plant nutrients, and the moderate content of salt

Management measures:

- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming, terraces, and grassed waterways help to control water erosion, but the slopes in some

areas are too short or too irregular for contour farming and terraces.

- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.
- Salt-tolerant crops should be planted.

Interpretive Groups

Land capability classification: Great Bend—IIIe-1; Zell—IVe-3; Huffton—IVe-3

Range site: Great Bend—Silty; Zell—Thin Upland; Huffton—Thin Upland

Windbreak suitability group: Great Bend—3; Zell—8; Huffton—8

Pasture suitability group: Great Bend—F; Zell—G; Huffton—G

HaA—Hamerly loam, 0 to 2 percent slopes**Composition**

Hamerly and similar soils: 75 to 90 percent

Contrasting inclusions: 10 to 25 percent

Setting

Landform: Till plains

Landform position: Foot slopes

Slope range: 0 to 2 percent

Shape of areas: Long and narrow

Size of areas: 5 to 100 acres

Typical Profile*Surface layer:*

0 to 11 inches—dark gray, calcareous loam

Subsoil:

11 to 23 inches—light brownish gray, calcareous loam

23 to 28 inches—light yellowish brown, mottled, calcareous loam

Underlying material:

28 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Somewhat poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: 1.5 to 3.5 feet

Flooding: None

Ponding: None

Permeability: Moderately slow

Available water capacity: Moderate

Organic matter content: Moderate

Surface runoff: Slow

Other properties: A high content of lime

Inclusions

Contrasting inclusions:

- The moderately well drained Aastad soils, which are not calcareous at or near the surface and have dark colors more than 16 inches thick; on foot slopes
- The very poorly drained Parnell soils in basins
- The poorly drained Vallers soils on toe slopes

Similar soils:

- Soils that have more silt and less sand

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: The high content of lime, which adversely affects the availability of plant nutrients; wind erosion

Management measures:

- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.

Interpretive Groups

Land capability classification: IIs-4

Range site: Limy Subirrigated

Windbreak suitability group: 1

Pasture suitability group: F

HaB—Hamerly loam, 2 to 6 percent slopes

Composition

Hamerly and similar soils: 75 to 85 percent

Contrasting inclusions: 15 to 25 percent

Setting

Landform: Till plains

Landform position: Foot slopes

Slope range: 2 to 6 percent

Shape of areas: Irregular

Size of areas: 10 to 80 acres

Typical Profile

Surface layer:

0 to 11 inches—dark gray, calcareous loam

Subsoil:

11 to 23 inches—light brownish gray, calcareous loam

23 to 28 inches—light yellowish brown, mottled, calcareous loam

Underlying material:

28 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Somewhat poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: 1.5 to 3.5 feet

Flooding: None

Ponding: None

Permeability: Moderately slow

Available water capacity: Moderate

Organic matter content: Moderate

Surface runoff: Rapid

Other properties: A high content of lime

Inclusions

Contrasting inclusions:

- The well drained Forman soils, which are not calcareous at or near the surface; on back slopes
- The very poorly drained Parnell soils in basins
- The poorly drained Vallers soils on toe slopes

Similar soils:

- Soils that have more silt and less sand

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Wind erosion and water erosion; the high content of lime, which adversely affects the availability of plant nutrients

Management measures:

- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
- Contour farming and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.

Interpretive Groups

Land capability classification: IIIe-8

Range site: Limy Subirrigated

Windbreak suitability group: 1

Pasture suitability group: F

Hb—Hamerly-Parnell complex**Composition**

Hamerly and similar soils: 45 to 60 percent

Parnell and similar soils: 30 to 45 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains

Landform position: Hamerly—foot slopes; Parnell—basins

Slope range: Hamerly—0 to 4 percent; Parnell—0 to 1 percent

Shape of areas: Irregular

Size of areas: 10 to 200 acres

Typical Profile**Hamerly**

Surface layer:

0 to 11 inches—dark gray, calcareous loam

Subsoil:

11 to 23 inches—light brownish gray, calcareous loam

23 to 28 inches—light yellowish brown, mottled, calcareous loam

Underlying material:

28 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Parnell

Surface soil:

0 to 17 inches—dark gray silty clay loam

Subsoil:

17 to 38 inches—dark gray silty clay

Underlying material:

38 to 47 inches—dark gray, calcareous clay

47 to 60 inches—light gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Hamerly—somewhat poorly drained; Parnell—very poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: Hamerly—at a depth of 1.5 to 3.5 feet; Parnell—1.0 foot above to 0.5 foot below the surface

Flooding: None

Ponding: Hamerly—none; Parnell—frequent for very long periods

Permeability: Hamerly—moderately slow; Parnell—slow

Available water capacity: Hamerly—moderate; Parnell—high

Organic matter content: Hamerly—moderate; Parnell—high

Surface runoff: Hamerly—slow; Parnell—negligible

Other properties: A high content of lime in the Hamerly soil

Inclusions

Contrasting inclusions:

- The moderately well drained Aastad soils on foot slopes
- The well drained Forman soils on back slopes
- The poorly drained Vallers soils on toe slopes

Similar soils:

- Calcareous soils in basins

Use and Management**Cropland and pasture**

Main crops: Hamerly—alfalfa, barley, corn, oats, and wheat; Parnell—generally not suited to crops

Management concerns: Hamerly—the high content of lime, which adversely affects the availability of plant nutrients, and wind erosion; Parnell—wetness

Management measures:

- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.
- The existing drainage systems should be maintained in areas of the Parnell soil.
- Deferring tillage in areas of the Parnell soil during wet periods helps to prevent surface compaction.
- Restricting grazing during wet periods also helps to prevent surface compaction.

Interpretive Groups

Land capability classification: Hamerly—IIs-4; Parnell—Vw-2

Range site: Hamerly—Limy Subirrigated; Parnell—Shallow Marsh

Windbreak suitability group: Hamerly—1; Parnell—10

Pasture suitability group: Hamerly—F; Parnell—B2

Hd—Harmony-Aberdeen silty clay loams**Composition**

Harmony and similar soils: 45 to 55 percent

Aberdeen and similar soils: 30 to 45 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Lake plains

Landform position: Harmony—summits and back slopes; Aberdeen—foot slopes

Slope range: 0 to 2 percent

Shape of areas: Irregular

Size of areas: 10 to 100 acres

Typical Profile

Harmony

Surface soil:

0 to 10 inches—dark gray silty clay loam

Subsoil:

10 to 26 inches—dark gray and grayish brown silty clay

26 to 36 inches—light brownish gray, calcareous silty clay loam

Underlying material:

36 to 46 inches—light brownish gray, calcareous silty clay loam

46 to 60 inches—light gray, calcareous silt loam

Aberdeen

Surface layer:

0 to 8 inches—dark gray silty clay loam

Transitional layer:

8 to 12 inches—dark gray and gray silty clay loam

Subsoil:

12 to 37 inches—dark gray and grayish brown silty clay

37 to 45 inches—light brownish gray, calcareous silty clay with nests of gypsum and other salts

Underlying material:

45 to 53 inches—light gray, calcareous silty clay loam

53 to 60 inches—light gray, mottled, calcareous, varved silty clay loam

Soil Properties and Qualities

Drainage class: Moderately well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: 3.5 to 5.0 feet

Flooding: None

Ponding: None

Permeability: Harmony—moderately slow in the upper part, moderate to slow in the lower part;

Aberdeen—slow

Available water capacity: High

Organic matter content: Harmony—high; Aberdeen—moderate

Surface runoff: Slow

Inclusions

Contrasting inclusions:

- The well drained Beotia soils, which have less clay and more silt in the subsoil than the major soils; on foot slopes
- The somewhat poorly drained Exline soils, which have salts within a depth of 16 inches; on the lower foot slopes
- The moderately well drained Nahon soils, which have a more dense, root-restricting subsoil than the Aberdeen soil; on foot slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Harmony—slow rate of water infiltration; Aberdeen—the sodium-affected subsoil, which adversely affects crop growth by restricting the penetration of plant roots, and a slow rate of water infiltration

Management measures:

- Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system conserve moisture and maintain organic matter content and tilth.
- Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: Harmony—IIs-1; Aberdeen—IIIs-1

Range site: Harmony—Clayey; Aberdeen—Clayey

Windbreak suitability group: Harmony—4; Aberdeen—4

Pasture suitability group: Harmony—E; Aberdeen—E

Hm—Harmony-Beotia silt loams

Composition

Harmony and similar soils: 50 to 65 percent

Beotia and similar soils: 25 to 40 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Lake plains

Landform position: Foot slopes

Slope range: 0 to 2 percent

Shape of areas: Irregular

Size of areas: 10 to 150 acres

Typical Profile

Harmony

Surface soil:

0 to 10 inches—dark gray silt loam

Subsoil:

10 to 26 inches—dark gray and grayish brown silty clay

26 to 36 inches—light brownish gray, calcareous silty clay loam

Underlying material:

36 to 46 inches—light brownish gray, calcareous silty clay loam

46 to 60 inches—light gray, calcareous silt loam

Beotia

Surface soil:

0 to 10 inches—dark gray silt loam

Subsoil:

10 to 24 inches—grayish brown silt loam
 24 to 35 inches—light brownish gray, calcareous silt loam

Underlying material:

35 to 54 inches—light brownish gray and light gray, calcareous silt loam and silty clay loam; mottled in the lower part
 54 to 60 inches—light brownish gray, calcareous, varved silt loam

Soil Properties and Qualities

Drainage class: Harmony—moderately well drained; Beotia—well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: Harmony—3.5 to 5.0 feet; Beotia—more than 6 feet

Flooding: None

Ponding: None

Permeability: Harmony—moderately slow in the upper part, moderate to slow in the lower part; Beotia—moderate in the upper part, moderate to slow in the lower part

Available water capacity: High

Organic matter content: Harmony—moderate; Beotia—high

Surface runoff: Slow

Inclusions*Contrasting inclusions:*

- The moderately well drained Aberdeen soils, which have a sodium-affected subsoil; on the lower foot slopes
- The moderately well drained Rondell soils, which are calcareous at or near the surface; on the lower foot slopes

Use and Management**Cropland**

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Harmony—slow rate of water infiltration; Beotia—few limitations

Management measures:

- Measures that conserve moisture are needed in areas of the Beotia soil.
- Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system conserve moisture and maintain organic matter content and tilth.
- Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: Harmony—IIs-1; Beotia—IIC-3

Range site: Harmony—Clayey; Beotia—Silty

Windbreak suitability group: Harmony—4; Beotia—3

Pasture suitability group: Harmony—E; Beotia—K

Hr—Harriet loam**Composition**

Harriet and similar soils: 80 to 90 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Flood plains

Landform position: Low flood plains

Slope range: 0 to 1 percent

Shape of areas: Long and narrow

Size of areas: 10 to 200 acres

Typical Profile*Surface layer:*

0 to 1 inch—dark gray loam with nests of salt

Subsoil:

1 to 16 inches—dark gray, calcareous silty clay with nests of salt

Underlying material:

16 to 24 inches—dark gray, calcareous clay loam with nests of salt

24 to 60 inches—olive gray and light olive gray, mottled, calcareous clay loam with nests of gypsum and other salts

Soil Properties and Qualities

Drainage class: Poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: At the surface to 1 foot below the surface

Flooding: Occasional for long periods

Ponding: None

Permeability: Very slow

Available water capacity: Moderate

Organic matter content: Moderate

Surface runoff: Very slow

Inclusions*Contrasting inclusions:*

- The somewhat poorly drained Ranslo soils, which have a thicker surface layer than the Harriet soil; on the slightly higher parts of low flood plains
- Playmoor soils, which have more silt and less clay than the Harriet soil; on low flood plains

Use and Management

Rangeland

Management concerns: Wetness, high salt content

Management measures:

- Proper grazing management helps to maintain plant vigor and conserves moisture.
- Cultivated areas should be seeded to adapted native grasses.

Interpretive Groups

Land capability classification: VIs-6

Range site: Saline Lowland

Windbreak suitability group: 10

Pasture suitability group: J

HtA—Hetland silty clay loam, 0 to 2 percent slopes

Composition

Hetland and similar soils: 80 to 90 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Ice-walled lake plains

Landform position: Summits

Slope range: 0 to 2 percent

Shape of areas: Oval

Size of areas: 10 to 100 acres

Typical Profile

Surface layer:

0 to 9 inches—very dark gray silty clay loam

Subsoil:

9 to 29 inches—very dark gray and grayish brown silty clay

29 to 37 inches—light olive brown, calcareous silty clay loam

Underlying material:

37 to 52 inches—light brownish gray, calcareous silty clay loam

52 to 60 inches—light gray, calcareous, varved silty clay loam

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Slow

Available water capacity: High

Organic matter content: High

Surface runoff: Medium

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Cubden soils, which are calcareous at or near the surface; on foot slopes
- The well drained Poinsett soils, which have less clay and more silt than the Hetland soil; on back slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Slight

Management measures:

- Managing crop residue conserves moisture and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: I-2

Range site: Silty

Windbreak suitability group: 4

Pasture suitability group: F

HuB—Hetland-Rusklyn silty clay loams, 2 to 6 percent slopes

Composition

Hetland and similar soils: 45 to 60 percent

Rusklyn and similar soils: 30 to 45 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Ice-walled lake plains

Landform position: Hetland—summits and back slopes; Rusklyn—shoulder slopes

Slope range: 2 to 6 percent

Shape of areas: Irregular

Size of areas: 10 to 100 acres

Typical Profile

Hetland

Surface layer:

0 to 9 inches—very dark gray silty clay loam

Subsoil:

9 to 29 inches—very dark gray and grayish brown silty clay

29 to 37 inches—light olive brown, calcareous silty clay loam

Underlying material:

37 to 52 inches—light brownish gray, calcareous silty clay loam

52 to 60 inches—light gray, calcareous, varved silty clay loam

Rusklyn*Surface layer:*

0 to 9 inches—dark grayish brown, calcareous silty clay loam

Subsoil:

9 to 28 inches—light yellowish brown, calcareous silty clay loam

Underlying material:

28 to 53 inches—light yellowish brown and light gray, mottled, calcareous silty clay loam stratified with lenses of very fine sand

53 to 60 inches—light brownish gray and pale yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Very deep

Depth to contrasting layer: Hetland—more than 60 inches; Rusklyn—40 to more than 60 inches over loamy glacial till

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Hetland—slow; Rusklyn—moderate

Available water capacity: High

Organic matter content: Hetland—high; Rusklyn—moderate

Surface runoff: Medium

Other properties: A high content of lime in the Rusklyn soil

Inclusions*Contrasting inclusions:*

- The well drained Egeland soils, which have less clay and more sand than the major soils; on back slopes
- The somewhat poorly drained Cubden soils on foot slopes

Similar soils:

- Soils that have less clay and more silt than the Hetland soil

Use and Management**Cropland**

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Hetland—wind erosion and water erosion; Rusklyn—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients

Management measures:

- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming and grassed waterways help to control water erosion.

- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.

Interpretive Groups

Land capability classification: Hetland—Ile-3; Rusklyn—IIle-6

Range site: Hetland—Silty; Rusklyn—Thin Upland

Windbreak suitability group: Hetland—4; Rusklyn—8

Pasture suitability group: Hetland—F; Rusklyn—G

KbE—Kloten-Buse complex, 9 to 40 percent slopes**Composition**

Kloten and similar soils: 35 to 55 percent

Buse and similar soils: 25 to 40 percent

Contrasting inclusions: 5 to 25 percent

Setting

Landform: Moraines

Landform position: Kloten—back slopes; Buse—shoulder slopes

Slope range: 9 to 40 percent

Shape of areas: Irregular

Size of areas: 10 to 500 acres

Typical Profile**Kloten***Surface layer:*

0 to 6 inches—dark gray silt loam

Underlying material:

6 to 14 inches—dark grayish brown silty clay loam

14 to 60 inches—gray shale

Buse*Surface layer:*

0 to 7 inches—dark grayish brown, calcareous loam

Subsoil:

7 to 22 inches—light yellowish brown, calcareous clay loam

Underlying material:

22 to 60 inches—light yellowish brown, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Kloten—shallow; Buse—very deep

Depth to contrasting layer: Kloten—12 to 20 inches over shale; Buse—more than 60 inches

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Kloten—moderate in the loamy sediments and very slow in the underlying shale; Buse—moderately slow

Available water capacity: Kloten—low; Buse—high

Organic matter content: Moderately low

Surface runoff: Very rapid

Other properties: A high content of lime in the Buse soil

Inclusions

Contrasting inclusions:

- The well drained Barnes and Forman soils, which are dark to a depth of more than 7 inches; on back slopes
- The well drained Edgeley soils, which have shale at a depth of 20 to 40 inches; on foot slopes
- The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes

Similar soils:

- Soils that have a thinner surface layer than the Buse soil

Use and Management

Rangeland

Management concerns: Water erosion

Management measures:

- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Kloten—Vile-3; Buse—Vile-3

Range site: Kloten—Shallow; Buse—Thin Upland

Windbreak suitability group: Kloten—10; Buse—10

Pasture suitability group: Kloten—NS; Buse—NS

KrB—Kranzburg-Brookings-Buse complex, 1 to 6 percent slopes

Composition

Kranzburg and similar soils: 35 to 50 percent

Brookings and similar soils: 20 to 35 percent

Buse and similar soils: 15 to 25 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains

Landform position: Kranzburg—summits and back slopes; Brookings—foot slopes; Buse—shoulder slopes

Slope range: Kranzburg—2 to 6 percent; Brookings—1 to 2 percent; Buse—3 to 6 percent

Shape of areas: Irregular

Size of areas: 10 to 100 acres

Typical Profile

Kranzburg

Surface layer:

0 to 9 inches—very dark gray silt loam

Subsoil:

9 to 27 inches—dark grayish brown and brown silt loam

27 to 39 inches—pale brown, calcareous clay loam

Underlying material:

39 to 60 inches—light yellowish brown, calcareous clay loam

Brookings

Surface soil:

0 to 13 inches—dark gray silt loam

Subsoil:

13 to 27 inches—dark grayish brown and brown silt loam

27 to 35 inches—light gray, calcareous clay loam

Underlying material:

35 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Buse

Surface layer:

0 to 7 inches—dark grayish brown, calcareous loam

Subsoil:

7 to 22 inches—light yellowish brown, calcareous clay loam

Underlying material:

22 to 60 inches—light yellowish brown, calcareous clay loam

Soil Properties and Qualities

Drainage class: Kranzburg—well drained; Brookings—moderately well drained; Buse—well drained

Depth to bedrock: Very deep

Depth to contrasting layer: Kranzburg—20 to 40 inches over loamy glacial till; Brookings—20 to 40 inches over loamy glacial till; Buse—more than 60 inches

Depth to seasonal high water table: Kranzburg—more than 6 feet; Brookings—3 to 5 feet; Buse—more than 6 feet

Flooding: None

Ponding: None

Permeability: Moderately slow

Available water capacity: High

Organic matter content: Kranzburg—high; Brookings—high; Buse—moderately low

Surface runoff: Kranzburg—medium; Brookings—slow; Buse—medium

Other properties: A high content of lime in the Buse soil

Inclusions

Contrasting inclusions:

- The moderately well drained Aastad soils, which are dark to a depth of more than 16 inches; on foot slopes
- Barnes soils, which have more sand and less silt than the Kranzburg soil; on back slopes
- The moderately well drained Cresbard soils, which have a sodium-affected subsoil; on back slopes

Similar soils:

- Soils that have loam or clay loam underlying material below a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Kranzburg—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients

Management measures:

- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming and grassed waterways help to control water erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: Kranzburg—Ile-1;

Brookings—Ilc-3; Buse—IIle-12

Range site: Kranzburg—Silty; Brookings—Loamy Overflow; Buse—Thin Upland

Windbreak suitability group: Kranzburg—3; Brookings—1; Buse—8

Pasture suitability group: Kranzburg—F; Brookings—K; Buse—G

Ks—Kranzburg-Brookings silt loams, 0 to 2 percent slopes

Composition

Kranzburg and similar soils: 55 to 70 percent

Brookings and similar soils: 15 to 30 percent

Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains

Landform position: Kranzburg—summits and back slopes; Brookings—foot slopes

Slope range: 0 to 2 percent

Shape of areas: Irregular

Size of areas: 10 to 500 acres

Typical Profile

Kranzburg

Surface layer:

0 to 9 inches—very dark gray silt loam

Subsoil:

9 to 27 inches—dark grayish brown and brown silt loam

27 to 39 inches—pale brown, calcareous clay loam

Underlying material:

39 to 60 inches—light yellowish brown, calcareous clay loam

Brookings

Surface soil:

0 to 13 inches—dark gray silt loam

Subsoil:

13 to 27 inches—dark grayish brown and brown silt loam

27 to 35 inches—light gray, calcareous clay loam

Underlying material:

35 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Kranzburg—well drained; Brookings—moderately well drained

Depth to bedrock: Very deep

Depth to contrasting layer: 20 to 40 inches over loamy glacial till

Depth to seasonal high water table: Kranzburg—more than 6 feet; Brookings—3 to 5 feet

Flooding: None

Ponding: None

Permeability: Moderately slow

Available water capacity: High

Organic matter content: High

Surface runoff: Slow

Inclusions

Contrasting inclusions:

- The moderately well drained Cresbard soils, which have a sodium-affected subsoil; on foot slopes
- The well drained Barnes soils, which have less silt and more sand in the surface layer than the major soils; on back slopes
- The well drained Buse soils, which have less silt and more sand in the surface layer than the major soils and are calcareous to the surface; on shoulder slopes
- The poorly drained Tonka soils in basins

Similar soils:

- Soils that have clay loam underlying material at a depth of more than 40 inches

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Few limitations

Management measures:

- Measures that conserve moisture are needed.
- Minimizing tillage and leaving crop residue on the surface conserve moisture.

Interpretive Groups

Land capability classification: Kranzburg—IIC-2;

Brookings—IIC-3

Range site: Kranzburg—Silty; Brookings—Loamy Overflow

Windbreak suitability group: Kranzburg—3; Brookings—1

Pasture suitability group: Kranzburg—F; Brookings—K

KtB—Kranzburg-Forman complex, 2 to 6 percent slopes

Composition

Kranzburg and similar soils: 40 to 55 percent

Forman and similar soils: 30 to 45 percent

Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains

Landform position: Kranzburg—summits and back slopes; Forman—back slopes

Slope range: 2 to 6 percent

Shape of areas: Irregular

Size of areas: 5 to 200 acres

Typical Profile

Kranzburg

Surface layer:

0 to 9 inches—very dark gray silty clay loam

Subsoil:

9 to 23 inches—dark gray and brown silty clay loam

23 to 36 inches—light yellowish brown, calcareous silty clay loam

36 to 43 inches—light yellowish brown, calcareous clay loam

Underlying material:

43 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Forman

Surface layer:

0 to 8 inches—very dark gray loam

Subsoil:

8 to 15 inches—brown clay loam

15 to 28 inches—light brownish gray, calcareous clay loam

Underlying material:

28 to 60 inches—light yellowish brown, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Very deep

Depth to contrasting layer: Kranzburg—20 to 40 inches over loamy glacial till; Forman—more than 60 inches

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Moderately slow

Available water capacity: High

Organic matter content: High

Surface runoff: Medium

Inclusions

Contrasting inclusions:

- The well drained Buse soils, which are calcareous at or near the surface; on shoulder slopes
- The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on back slopes
- The well drained Rusklyn soils, which do not have clay loam underlying material above a depth of 40 inches and are calcareous to the surface; on shoulder slopes
- The moderately well drained Waubay soils, which do not have clay loam underlying material above a depth of 40 inches and are dark to a depth of more than 16 inches; on foot slopes

Similar soils:

- Soils that have a deeper silty mantle than that of the Kranzburg soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Water erosion

Management measures:

- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming and grassed waterways help to control water erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: Kranzburg—IIE-3;

Forman—IIE-2

Range site: Kranzburg—Silty; Forman—Silty
Windbreak suitability group: Kranzburg—3; Forman—3
Pasture suitability group: Kranzburg—F; Forman—F

La—La Prairie loam

Composition

La Prairie and similar soils: 85 to 95 percent
 Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains
Landform position: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
 0 to 8 inches—very dark gray loam
Subsurface layer:
 8 to 16 inches—dark gray, calcareous loam
Subsoil:
 16 to 31 inches—gray, calcareous clay loam
Underlying material:
 31 to 48 inches—light brownish gray, calcareous clay loam
 48 to 60 inches—gray, calcareous clay loam

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over clayey or sandy material
Depth to seasonal high water table: 3.5 to 5.0 feet
Flooding: Rare
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: High
Surface runoff: Slow

Inclusions

Contrasting inclusions:

- The poorly drained Harriet soils, which have a sodium-affected subsoil and have salts near the surface; on low flood plains
- The poorly drained Holmquist soils, which have salts at or near the surface; on low flood plains
- The somewhat poorly drained Lamoure soils, which have less sand and more silt than the La Prairie soil; on low flood plains

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Few limitations

Management measures:

- Measures that conserve moisture are needed.
- Managing crop residue conserves moisture and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: IIc-1

Range site: Silty

Windbreak suitability group: 1

Pasture suitability group: K

Lh—La Prairie-Holmquist loams, channeled

Composition

La Prairie and similar soils: 40 to 55 percent
 Holmquist and similar soils: 30 to 45 percent
 Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains
Landform position: La Prairie—high flood plains;
 Holmquist—low flood plains
Slope range: La Prairie—0 to 2 percent; Holmquist—0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 10 to 500 acres

Typical Profile

La Prairie

Surface layer:
 0 to 8 inches—very dark gray loam
Subsurface layer:
 8 to 16 inches—dark gray, calcareous loam
Subsoil:
 16 to 31 inches—gray, calcareous clay loam
Underlying material:
 31 to 48 inches—light brownish gray, calcareous clay loam
 48 to 60 inches—gray, calcareous clay loam

Holmquist

Surface layer:
 0 to 8 inches—dark gray, calcareous loam with nests of salt
Underlying material:
 8 to 26 inches—grayish brown, mottled, calcareous, stratified loam and sandy loam with nests of salt
 26 to 60 inches—gray and dark gray, mottled,

calcareous, stratified loam and sandy loam with nests of salt

Soil Properties and Qualities

Drainage class: La Prairie—moderately well drained;

Holmquist—poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: La Prairie—40 to more than

60 inches over clayey or sandy material;

Holmquist—more than 60 inches

Depth to seasonal high water table: La Prairie—3.5 to

5.0 feet; Holmquist—0.5 foot to 1.5 feet

Flooding: La Prairie—occasional for brief periods;

Holmquist—frequent for brief periods

Ponding: None

Permeability: Moderate

Available water capacity: High

Organic matter content: La Prairie—high; Holmquist—moderate

Surface runoff: Slow

Other properties: Areas of these soils are typically dissected by meandering stream channels.

Inclusions

Contrasting inclusions:

- The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on back slopes
- The well drained Forman soils, which formed in loamy glacial till; on back slopes
- The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes
- The very poorly drained Rauville soils, which have less sand and more silt than the major soils; on low flood plains

Use and Management

Cropland, rangeland, or pasture

Management considerations:

- Because of the wetness and the channeling, which limits the use of machinery, these soils are generally not suited to crops.

Management measures:

- Proper grazing management maintains plant vigor and helps to control streambank erosion.
- Cultivated areas should be seeded to adapted grasses.

Interpretive Groups

Land capability classification: La Prairie—Vlw-1;

Holmquist—Vlw-1

Range site: La Prairie—Loamy Overflow; Holmquist—Saline Subirrigated

Windbreak suitability group: La Prairie—1; Holmquist—10

Pasture suitability group: La Prairie—NS; Holmquist—NS

Lm—Lamoure silty clay loam

Composition

Lamoure and similar soils: 80 to 90 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Flood plains

Landform position: Low flood plains

Slope range: 0 to 1 percent

Shape of areas: Irregular

Size of areas: 10 to 100 acres

Typical Profile

Surface soil:

0 to 28 inches—dark gray, calcareous silty clay loam

Underlying material:

28 to 56 inches—gray and light olive gray, mottled, calcareous silty clay loam

56 to 60 inches—gray, mottled, calcareous, stratified clay loam and gravelly clay loam

Soil Properties and Qualities

Drainage class: Somewhat poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: 1 to 2 feet

Flooding: Occasional for brief periods

Ponding: None

Permeability: Moderately slow

Available water capacity: High

Organic matter content: High

Surface runoff: Slow

Other properties: A high content of lime

Inclusions

Contrasting inclusions:

- The moderately well drained La Prairie soils, which have less silt and more sand than the Lamoure soil; on high flood plains
- The poorly drained Ludden soils, which have less silt and more clay than the Lamoure soil; on low flood plains
- The very poorly drained Rauville soils on low flood plains

Similar soils:

- Soils in which the dark surface layer is less than 24 inches thick

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Wetness, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients

Management measures:

- In wet years this soil is better suited to late planted crops.
- Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth, minimize surface compaction, and control wind erosion.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.
- Existing drainage systems should be maintained.

Interpretive Groups

Land capability classification: 1lw-2

Range site: Subirrigated

Windbreak suitability group: 2

Pasture suitability group: A

Lo—Lowe loam

Composition

Lowe and similar soils: 80 to 90 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Flood plains

Landform position: Low flood plains

Slope range: 0 to 1 percent

Shape of areas: Irregular

Size of areas: 5 to 40 acres

Typical Profile

Surface layer:

0 to 10 inches—very dark gray, calcareous loam

Subsoil:

10 to 34 inches—gray and light gray, calcareous loam

Underlying material:

34 to 56 inches—light gray, mottled, calcareous silt loam

56 to 60 inches—light gray, mottled, calcareous gravelly loam

Soil Properties and Qualities

Drainage class: Poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: At the surface to 1.5 feet below the surface

Flooding: Occasional for brief periods

Ponding: None

Permeability: Moderate

Available water capacity: High

Organic matter content: High

Surface runoff: Slow

Other properties: A high content of lime

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Hamerly soils, which formed in clay loam glacial till; on foot slopes along the edges of the unit
- The moderately well drained La Prairie soils on high flood plains

Similar soils:

- Soils that have more silt and less sand
- Soils in which the underlying material is clay loam glacial till

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Wetness, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients

Management measures:

- In wet years this soil is better suited to late planted crops.
- Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth, minimize surface compaction, and control wind erosion.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.
- Existing drainage systems should be maintained.

Interpretive Groups

Land capability classification: 1Vw-3

Range site: Subirrigated

Windbreak suitability group: 10

Pasture suitability group: A

Lu—Ludden silty clay

Composition

Ludden and similar soils: 80 to 90 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Flood plains

Landform position: Low flood plains

Slope range: 0 to 1 percent

Shape of areas: Long and narrow

Size of areas: 10 to 200 acres

Typical Profile

Surface layer:

0 to 7 inches—dark gray silty clay

Subsoil:

7 to 31 inches—dark gray and gray, calcareous silty clay

31 to 52 inches—gray, calcareous silty clay with nests of gypsum and other salts

Underlying material:

52 to 60 inches—light olive gray, mottled, calcareous silty clay with nests of gypsum

Soil Properties and Qualities

Drainage class: Poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: 0.5 foot above to 1.5 feet below the surface

Flooding: Frequent for brief or long periods

Ponding: None

Permeability: Slow

Available water capacity: Moderate

Organic matter content: High

Surface runoff: Very slow

Other properties: A high content of lime

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Lamoure soils, which have less clay and more silt than the Ludden soil; on low flood plains
- Playmoor soils, which have more silt and less clay than the Ludden soil; on low flood plains

Use and Management**Cropland**

Main crops: Barley, corn, oats, and wheat

Management concerns: Wetness, wind erosion, a slow rate of water infiltration, tilth, and a risk of surface compaction if the soil is tilled when wet

Management measures:

- In most years this soil is better suited to late planted crops.
- Deferring tillage when the soil is wet helps to maintain tilth and prevent surface compaction.
- Including grasses and legumes in the rotation helps to

control erosion and maintains organic matter content and tilth.

- Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.
- Existing drainage systems should be maintained.

Interpretive Groups

Land capability classification: IVw-1

Range site: Wetland

Windbreak suitability group: 10

Pasture suitability group: B1

Lw—Ludden silty clay, ponded**Composition**

Ludden and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains

Landform position: Low flood plains

Slope range: 0 to 1 percent

Shape of areas: Long and narrow

Size of areas: 5 to 80 acres

Typical Profile

Surface layer:

0 to 7 inches—dark gray silty clay

Subsoil:

7 to 31 inches—dark gray and gray, calcareous silty clay

31 to 52 inches—gray, calcareous silty clay with nests of gypsum and other salts

Underlying material:

52 to 60 inches—light olive gray, mottled, calcareous silty clay with nests of gypsum

Soil Properties and Qualities

Drainage class: Very poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: 2 feet above to 1 foot below the surface

Flooding: Frequent for brief or long periods

Ponding: Frequent for long periods

Permeability: Slow

Available water capacity: Moderate

Organic matter content: High

Surface runoff: Negligible

Other properties: A high content of lime

Inclusions

Contrasting inclusions:

- The poorly drained Colvin soils, which have more

carbonates in the subsoil than the Ludden soil; on toe slopes

Similar soils:

- Soils that are calcareous at a greater depth

Use and Management

Management considerations:

- Because of wetness, areas of this soil are generally not suited to crops. They should be maintained as wildlife habitat.

Interpretive Groups

Land capability classification: VIIIw-1

Range site: Not assigned

Windbreak suitability group: 10

Pasture suitability group: NS

Lx—Ludden-Ludden, saline, silty clays

Composition

Ludden and similar soils: 40 to 55 percent

Ludden, saline, and similar soils: 35 to 50 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains

Landform position: Low flood plains

Slope range: 0 to 1 percent

Shape of areas: Long and narrow

Size of areas: 10 to 80 acres

Typical Profile

Ludden

Surface layer:

0 to 7 inches—dark gray silty clay

Subsoil:

7 to 31 inches—dark gray and gray, calcareous silty clay

31 to 52 inches—gray, calcareous silty clay with nests of gypsum and other salts

Underlying material:

52 to 60 inches—light olive gray, mottled, calcareous silty clay with nests of gypsum

Ludden, saline

Surface layer:

0 to 7 inches—dark gray silty clay with nests of salt

Subsoil:

7 to 31 inches—dark gray and gray, calcareous silty clay with nests of salt

31 to 52 inches—gray, calcareous silty clay with nests of gypsum and other salts

Underlying material:

52 to 60 inches—light olive gray, mottled, calcareous

silty clay with nests of gypsum

Soil Properties and Qualities

Drainage class: Poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: Ludden—0.5 foot above to 1.5 feet below the surface; Ludden, saline—at the surface to 1.5 feet below the surface

Flooding: Frequent for brief or long periods

Ponding: None

Permeability: Slow

Available water capacity: Moderate

Organic matter content: High

Surface runoff: Very slow

Other properties: A high content of lime in both soils; soluble salt in the saline Ludden soil

Inclusions

Contrasting inclusions:

- Lamoure soils, which have more silt and less clay than the Ludden soil; in the slightly higher positions on the landscape
- Playmoor soils, which have more silt and less clay than the saline Ludden soil; in positions on the landscape similar to those of the saline Ludden soil

Similar soils:

- Soils that are calcareous at a greater depth
- Soils in which the dark surface layer is less than 24 inches thick

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, and wheat

Management concerns: Wetness, wind erosion, a slow rate of water infiltration, tilth, the risk of compaction if the soils are tilled when wet, and the high content of salt in the saline Ludden soil

Management measures:

- In most years these soils are better suited to late planted crops.
- Deferring tillage when the soils are wet helps to maintain tilth and minimizes surface compaction.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content and tilth.
- Chiseling or subsoiling when the soils are dry increases the rate of water infiltration.
- Existing drainage systems should be maintained.

Interpretive Groups

Land capability classification: Ludden—IVw-1; Ludden, saline—IVw-5

Range site: Ludden—Wetland; Ludden, saline—Saline Lowland

Windbreak suitability group: Ludden—10; Ludden, saline—10

Pasture suitability group: Ludden—B1; Ludden, saline—J

MaA—Maddock-Egeland sandy loams, 0 to 2 percent slopes

Composition

Maddock and similar soils: 40 to 55 percent

Egeland and similar soils: 35 to 50 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains

Landform position: Maddock—shoulder slopes; Egeland—back slopes

Slope range: Maddock—1 to 2 percent; Egeland—0 to 2 percent

Shape of areas: Irregular

Size of areas: 10 to 50 acres

Typical Profile

Maddock

Surface layer:

0 to 9 inches—very dark gray sandy loam

Subsoil:

9 to 27 inches—dark grayish brown and brown loamy sand

Underlying material:

27 to 52 inches—pale brown, calcareous fine sand

52 to 60 inches—brown, calcareous sand

Egeland

Surface layer:

0 to 8 inches—very dark gray sandy loam

Subsoil:

8 to 30 inches—dark brown and brown sandy loam

30 to 36 inches—pale brown loamy sand

36 to 46 inches—pale brown, calcareous loamy sand

Underlying material:

46 to 60 inches—very pale brown, calcareous loamy sand

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Very deep

Depth to contrasting layer: Maddock—40 to more than 60 inches over loamy material; Egeland—more than 60 inches

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Maddock—rapid; Egeland—moderately rapid

Available water capacity: Maddock—low; Egeland—moderate

Organic matter content: Maddock—moderately low; Egeland—moderate

Surface runoff: Maddock—very slow; Egeland—slow

Inclusions

Contrasting inclusions:

- The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on back slopes
- The well drained Poinsett soils, which have less sand and more silt than the major soils; on back slopes
- The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on back slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, and wheat

Management concerns: Maddock—wind erosion, low available water capacity; Egeland—wind erosion, water erosion, moderate available water capacity

Management measures:

- These soils are better suited to early maturing crops, such as small grain.
- Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system help to control erosion, conserve moisture, and maintain the content of organic matter.
- Wind stripcropping and field windbreaks help to control wind erosion.

Interpretive Groups

Land capability classification: Maddock—III_s-1; Egeland—III_s-1

Range site: Maddock—Sandy; Egeland—Sandy

Windbreak suitability group: Maddock—5; Egeland—5

Pasture suitability group: Maddock—H; Egeland—H

MaB—Maddock-Egeland sandy loams, 2 to 6 percent slopes

Composition

Maddock and similar soils: 40 to 60 percent

Egeland and similar soils: 25 to 45 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains

Landform position: Maddock—shoulder slopes; Egeland—back slopes

Slope range: 2 to 6 percent

Shape of areas: Irregular
Size of areas: 10 to 80 acres

Typical Profile

Maddock

Surface layer:
 0 to 9 inches—very dark gray sandy loam
Subsoil:
 9 to 27 inches—dark grayish brown and brown loamy sand
Underlying material:
 27 to 52 inches—pale brown, calcareous fine sand
 52 to 60 inches—brown, calcareous sand

Egeland

Surface layer:
 0 to 8 inches—very dark gray sandy loam
Subsoil:
 8 to 30 inches—dark brown and brown sandy loam
 30 to 36 inches—pale brown loamy sand
 36 to 46 inches—pale brown, calcareous loamy sand
Underlying material:
 46 to 60 inches—very pale brown, calcareous loamy sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Maddock—40 to more than 60 inches over loamy material; Egeland—more than 60 inches
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Maddock—rapid; Egeland—moderately rapid
Available water capacity: Maddock—low; Egeland—moderate
Organic matter content: Maddock—moderately low; Egeland—moderate
Surface runoff: Maddock—very slow; Egeland—slow

Inclusions

Contrasting inclusions:

- The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on back slopes
- The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on back slopes

Similar soils:

- Soils that are dark to a depth of more than 16 inches

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, and wheat
Management concerns: Wind erosion and water erosion, low available water capacity
Management measures:

- These soils are better suited to early maturing crops, such as small grain.
- Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system help to control erosion, conserve moisture, and maintain the content of organic matter.
- Wind stripcropping and field windbreaks help to control wind erosion (fig. 8).

Interpretive Groups

Land capability classification: Maddock—IIIe-7; Egeland—IIIe-7
Range site: Maddock—Sandy; Egeland—Sandy
Windbreak suitability group: Maddock—5; Egeland—5
Pasture suitability group: Maddock—H; Egeland—H

MaC—Maddock-Egeland sandy loams, 6 to 12 percent slopes

Composition

Maddock and similar soils: 50 to 65 percent
 Egeland and similar soils: 20 to 40 percent
 Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Landform position: Maddock—shoulder slopes; Egeland—back slopes
Slope range: Maddock—6 to 12 percent; Egeland—6 to 9 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Maddock

Surface layer:
 0 to 9 inches—very dark gray sandy loam
Subsoil:
 9 to 27 inches—dark grayish brown and brown loamy sand
Underlying material:
 27 to 52 inches—pale brown, calcareous fine sand
 52 to 60 inches—brown, calcareous sand

Egeland

Surface layer:
 0 to 8 inches—very dark gray sandy loam



Figure 8.—Field windbreaks in an area of Maddock-Egeland sandy loams, 2 to 6 percent slopes.

Subsoil:

8 to 30 inches—dark brown and brown sandy loam
 30 to 36 inches—pale brown loamy sand
 36 to 46 inches—pale brown, calcareous loamy sand

Underlying material:

46 to 60 inches—very pale brown, calcareous loamy sand

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Very deep

Depth to contrasting layer: Maddock—40 to more than

60 inches over loamy material; Egeland—more than 60 inches

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Maddock—rapid; Egeland—moderately rapid

Available water capacity: Maddock—low; Egeland—moderate

Organic matter content: Maddock—moderately low; Egeland—moderate

Surface runoff: Maddock—slow; Egeland—medium

Inclusions

Contrasting inclusions:

- The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on back slopes
- The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on back slopes
- The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, and wheat

Management concerns: Wind erosion and water erosion, low available water capacity

Management measures:

- These soils are better suited to early maturing crops, such as small grain.
- Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system help to control erosion, conserve moisture, and maintain the content of organic matter.
- Contour farming, terraces, and grassed waterways help to control water erosion.
- Wind stripcropping and field windbreaks help to control wind erosion.

Interpretive Groups

Land capability classification: Maddock—Ive-3; Egeland—Ive-3

Range site: Maddock—Sandy; Egeland—Sandy

Windbreak suitability group: Maddock—5; Egeland—5

Pasture suitability group: Maddock—H; Egeland—H

Md—Marysland-Divide loams

Composition

Marysland and similar soils: 40 to 55 percent

Divide and similar soils: 30 to 45 percent

Contrasting inclusions: 5 to 20 percent

Setting

Landform: Flood plains and outwash plains

Landform position: Marysland—low flood plains; Divide—foot slopes

Slope range: Marysland—0 to 1 percent; Divide—0 to 2 percent

Shape of areas: Irregular

Size of areas: 5 to 100 acres

Typical Profile

Marysland

Surface layer:

0 to 9 inches—very dark gray, calcareous loam

Subsurface layer:

9 to 14 inches—dark gray, calcareous loam

Subsoil:

14 to 30 inches—light brownish gray, mottled, calcareous loam

Underlying material:

30 to 60 inches—light gray and light yellowish brown, calcareous gravelly sand

Divide

Surface layer:

0 to 9 inches—dark gray, calcareous loam

Subsoil:

9 to 18 inches—light brownish gray, calcareous clay loam

18 to 25 inches—light yellowish brown, mottled, calcareous clay loam

Underlying material:

25 to 60 inches—light yellowish brown, calcareous gravelly sand

Soil Properties and Qualities

Drainage class: Marysland—poorly drained; Divide—somewhat poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: 20 to 40 inches over gravelly material

Depth to seasonal high water table: Marysland—0.5 foot to 1.5 feet; Divide—1.5 to 3.5 feet

Flooding: Marysland—occasional for brief periods; Divide—none

Ponding: None

Permeability: Moderate in the loamy sediments and rapid in the underlying gravelly material

Available water capacity: Moderate

Organic matter content: Marysland—high; Divide—moderate

Surface runoff: Marysland—very slow; Divide—slow

Other properties: A high content of lime in both soils

Inclusions

Contrasting inclusions:

- The well drained Fordville soils, which are not calcareous at or near the surface; on back slopes
- The somewhat poorly drained Hamerly soils, which do not have gravelly material within a depth of 40 inches; on foot slopes
- The poorly drained Oldham soils, which do not have gravelly material within a depth of 40 inches; in basins
- The poorly drained Vallers soils, which do not have

gravelly material within a depth of 40 inches; on toe slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, oats, and wheat

Management concerns: Wetness, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients

Management measures:

- In most years these soils are better suited to early maturing crops.
- Leaving crop residue on the surface and deferring tillage when the soils are wet maintain tilth and help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.
- Existing drainage systems should be maintained.

Interpretive Groups

Land capability classification: Marysland—IVw-3; Divide—IIIs-4

Range site: Marysland—Subirrigated; Divide—Limy Subirrigated

Windbreak suitability group: Marysland—10; Divide—1

Pasture suitability group: Marysland—B1; Divide—D1

MfB—Mauvais clay loam, 2 to 6 percent slopes

Composition

Mauvais and similar soils: 80 to 90 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Wave-cut platform

Landform position: Toe slopes

Slope range: 2 to 6 percent

Shape of areas: Irregular

Size of areas: 10 to 150 acres

Typical Profile

Surface layer:

0 to 4 inches—dark gray, calcareous clay loam

Underlying material:

4 to 18 inches—grayish brown, mottled, calcareous clay loam

18 to 60 inches—olive gray, mottled, calcareous clay loam with nests of gypsum

Soil Properties and Qualities

Drainage class: Somewhat poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: 1.0 to 3.5 feet

Flooding: None

Ponding: Rare for long or very long periods

Permeability: Moderately slow

Available water capacity: High

Organic matter content: Moderate

Surface runoff: Medium

Other properties: A high content of lime

Inclusions

Contrasting inclusions:

- The poorly drained Minnewaukan soils, which have more sand and less clay than the Mauvais soil; on toe slopes
- The very poorly drained Southam soils, which are dark to a depth of more than 24 inches; in basins
- The poorly drained Vallers soils, which have less clay in the underlying material than the Mauvais soil; on toe slopes

Similar soils:

- Soils that have more sand and less clay in the surface layer

Use and Management

Cropland

Main crops: Alfalfa, barley, oats, and wheat

Management concerns: Wetness; the high content of lime, which adversely affects the availability of plant nutrients; and wind erosion

Management measures:

- Leaving crop residue on the surface and deferring tillage when the soil is wet maintain tilth and help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.
- Existing drainage systems should be maintained.

Interpretive Groups

Land capability classification: IVw-3

Range site: Subirrigated

Windbreak suitability group: 10

Pasture suitability group: A

MgB—Mauvais clay loam, 2 to 6 percent slopes, stony

Composition

Mauvais and similar soils: 75 to 85 percent

Contrasting inclusions: 15 to 25 percent

Setting

Landform: Wave-cut platform

Landform position: Toe slopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
 0 to 4 inches—dark gray, calcareous clay loam
Underlying material:
 4 to 18 inches—grayish brown, mottled, calcareous clay loam
 18 to 60 inches—olive gray, mottled, calcareous clay loam with nests of gypsum

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: 1.0 to 3.5 feet
Flooding: None
Ponding: Rare for long or very long periods
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Moderate
Surface runoff: Medium
Other properties: A high content of lime; scattered stones and boulders on the surface

Inclusions

Contrasting inclusions:

- The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on back slopes
- The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes
- The poorly drained Vallery soils, which have less clay in the underlying material than the Mauvais soil; on toe slopes

Similar soils:

- Soils that have more sand and less clay in the surface layer

Use and Management

Rangeland

Management concerns: Numerous stones and boulders (granitic rocks 1 to 3 feet in diameter covering less than 0.1 percent of the surface)
Management measures:

- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: VIIIs-1

Range site: Subirrigated
Windbreak suitability group: 10
Pasture suitability group: NS

MnA—Minnewasta sandy loam, 0 to 2 percent slopes

Composition

Minnewasta and similar soils: 75 to 85 percent
 Contrasting inclusions: 15 to 25 percent

Setting

Landform: Beach terraces
Landform position: Toe slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
 0 to 4 inches—very dark gray sandy loam
Underlying material:
 4 to 16 inches—light brownish gray and grayish brown, calcareous coarse sand and sand
 16 to 60 inches—light gray, mottled, calcareous sandy clay loam and clay loam

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 10 to 20 inches over glacial till
Depth to seasonal high water table: 1.0 to 3.5 feet
Flooding: None
Ponding: Rare for long or very long periods
Permeability: Rapid in the sandy sediments and slow in the underlying glacial till
Available water capacity: Moderate
Organic matter content: Moderately low
Surface runoff: Slow

Inclusions

Contrasting inclusions:

- The poorly drained Minnewaukan soils, which have more sand and less clay in the subsoil than the Minnewasta soil; on toe slopes
- The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes

Similar soils:

- Soils that have more clay and less sand in the surface layer

Use and Management

Cropland and pasture

Main crops: Alfalfa, barley, oats, and wheat

Management concerns: Wetness, wind erosion

Management measures:

- In wet years this soil is better suited to early maturing crops.
- Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system help to control erosion and maintain the content of organic matter.
- Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: IVw-1

Range site: Subirrigated

Windbreak suitability group: 10

Pasture suitability group: A

MoB—Minnewasta sandy loam, 2 to 6 percent slopes, stony

Composition

Minnewasta and similar soils: 75 to 85 percent

Contrasting inclusions: 15 to 25 percent

Setting

Landform: Beach terraces

Landform position: Toe slopes

Slope range: 2 to 6 percent

Shape of areas: Irregular

Size of areas: 10 to 250 acres

Typical Profile

Surface layer:

0 to 4 inches—very dark gray sandy loam

Underlying material:

4 to 16 inches—light brownish gray and grayish brown, calcareous coarse sand and sand

16 to 60 inches—light gray, mottled, calcareous sandy clay loam and clay loam

Soil Properties and Qualities

Drainage class: Somewhat poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: 10 to 20 inches over glacial till

Depth to seasonal high water table: 1.0 to 3.5 feet

Flooding: None

Ponding: Rare for long or very long periods

Permeability: Rapid in the sandy sediments and slow in the underlying glacial till

Available water capacity: Moderate

Organic matter content: Moderately low

Surface runoff: Slow

Other properties: Scattered stones and boulders on the surface

Inclusions

Contrasting inclusions:

- The somewhat excessively drained Arvilla soils, which have gravelly material at a depth of 14 to 25 inches; on back slopes
- The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes

Similar soils:

- Soils that have more clay and less sand in the surface layer

Use and Management

Rangeland

Management concerns: Numerous stones and boulders (granitic rocks 1 to 3 feet in diameter covering less than 0.1 percent of the surface)

Management measures:

- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: VIIs-1

Range site: Subirrigated

Windbreak suitability group: 10

Pasture suitability group: NS

Mw—Minnewaukan loamy sand

Composition

Minnewaukan and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Beach terraces

Landform position: Toe slopes

Slope range: 0 to 3 percent

Shape of areas: Irregular

Size of areas: 10 to 100 acres

Typical Profile

Surface layer:

0 to 4 inches—dark gray, calcareous loamy sand

Transitional layer:

4 to 9 inches—grayish brown, mottled, calcareous loamy sand

Underlying material:

9 to 31 inches—grayish brown and light gray, mottled,

calcareous, stratified fine sand, sand, and loamy sand
 31 to 60 inches—light brownish gray, mottled, calcareous, stratified loamy fine sand and loamy sand

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over loamy material
Seasonal high water table: 0.5 foot above to 1.5 feet below the surface
Flooding: None
Ponding: None
Permeability: Rapid
Available water capacity: Low
Organic matter content: Moderately low
Surface runoff: Very slow

Inclusions

Contrasting inclusions:
 • The somewhat poorly drained Minnewasta soils, which have clay loam underlying material; on toe slopes
Similar soils:
 • Soils that have a water table at a depth of more than 6 feet

Use and Management

Cropland and pasture

Main crops: Alfalfa, barley, oats, and wheat
Management concerns: Wetness, wind erosion
Management measures:
 • This soil is better suited to early maturing crops, such as small grain.
 • Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system help to control erosion and maintain the content of organic matter.
 • Wind stripcropping and field windbreaks help to control wind erosion.
 • Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: IVw-1
Range site: Subirrigated
Windbreak suitability group: 2
Pasture suitability group: A

Na—Nahon-Aberdeen-Exline silt loams

Composition

Nahon and similar soils: 40 to 55 percent

Aberdeen and similar soils: 15 to 30 percent
 Exline and similar soils: 10 to 25 percent
 Contrasting inclusions: 5 to 15 percent

Setting

Landform: Lake plains
Landform position: Nahon—foot slopes; Aberdeen—summits and back slopes; Exline—the lower foot slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Typical Profile

Nahon

Surface layer:
 0 to 7 inches—dark gray silt loam
Subsurface layer:
 7 to 8 inches—gray silt loam
Subsoil:
 8 to 19 inches—dark gray silty clay
 19 to 31 inches—dark gray and light brownish gray silty clay with nests of salt
 31 to 40 inches—light brownish gray, calcareous silty clay loam with nests of salt
Underlying material:
 40 to 55 inches—light gray, calcareous silty clay loam
 55 to 60 inches—white and pale yellow, calcareous, varved silty clay loam

Aberdeen

Surface layer:
 0 to 8 inches—dark gray silt loam
Transitional layer:
 8 to 12 inches—dark gray and gray silt loam
Subsoil:
 12 to 37 inches—dark gray and grayish brown silty clay
 37 to 45 inches—light brownish gray, calcareous silty clay with nests of gypsum and other salts
Underlying material:
 45 to 53 inches—light gray, calcareous silty clay loam
 53 to 60 inches—light gray, mottled, calcareous, varved silty clay loam

Exline

Surface layer:
 0 to 2 inches—gray silt loam
Subsoil:
 2 to 7 inches—dark gray and gray silty clay
 7 to 18 inches—dark gray silty clay with nests of salt
 18 to 26 inches—dark gray, calcareous silty clay with nests of salt
 26 to 37 inches—light brownish gray, calcareous silty clay loam with nests of salt

Underlying material:

37 to 60 inches—light gray and white, calcareous, varved silty clay loam

Soil Properties and Qualities

Drainage class: Nahon—moderately well drained; Aberdeen—moderately well drained; Exline—somewhat poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: Nahon—3.5 to 5.0 feet; Aberdeen—3.5 to 5.0 feet; Exline—1.5 to 3.5 feet

Flooding: None

Ponding: None

Permeability: Nahon—very slow; Aberdeen—slow; Exline—very slow

Available water capacity: Nahon—moderate; Aberdeen—high; Exline—moderate

Organic matter content: Nahon—moderate; Aberdeen—moderate; Exline—moderately low

Surface runoff: Nahon—slow; Aberdeen—slow; Exline—very slow

Other properties: A sodium-affected subsoil in all three soils

Inclusions*Contrasting inclusions:*

- The well drained Beotia soils, which have less clay than the major soils and do not have a sodium-affected subsoil; on foot slopes
- The somewhat poorly drained Bearden soils, which have less clay than the major soils and do not have a sodium-affected subsoil; on foot slopes
- The moderately well drained Harmony soils, which do not have a sodium-affected subsoil; on summits and back slopes

Use and Management**Cropland**

Main crops: Alfalfa, barley, oats, wheat

Management concerns: The sodium-affected subsoil, which adversely affects crop growth by restricting the penetration of plant roots; a slow rate of water infiltration

Management measures:

- Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system conserve moisture and maintain organic matter content and tilth.
- Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: Nahon—IVs-2; Aberdeen—IIIs-1; Exline—VIs-1

Range site: Nahon—Claypan; Aberdeen—Clayey; Exline—Thin Claypan

Windbreak suitability group: Nahon—9; Aberdeen—4; Exline—10

Pasture suitability group: Nahon—C; Aberdeen—E; Exline—NS

NsB—Nutley-Sinai silty clays, 2 to 6 percent slopes**Composition**

Nutley and similar soils: 50 to 65 percent

Sinai and similar soils: 20 to 35 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Ice-walled lake plains

Landform position: Nutley—shoulder slopes and back slopes; Sinai—foot slopes

Slope range: 2 to 6 percent

Shape of areas: Irregular

Size of areas: 10 to 200 acres

Typical Profile**Nutley***Surface layer:*

0 to 7 inches—dark gray, calcareous silty clay

Subsoil:

7 to 20 inches—light brownish gray, calcareous clay

Underlying material:

20 to 60 inches—pale yellow, mottled, calcareous clay

Sinai*Surface soil:*

0 to 12 inches—very dark gray silty clay

Subsoil:

12 to 23 inches—dark gray silty clay

23 to 33 inches—light brownish gray, calcareous silty clay

33 to 42 inches—light gray, mottled, calcareous silty clay

Underlying material:

42 to 60 inches—light brownish gray, mottled, calcareous silty clay with nests of gypsum

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: More than 6 feet

Flooding: None
Ponding: None
Permeability: Very slow
Available water capacity: Moderate
Organic matter content: High
Surface runoff: Rapid

Inclusions

Contrasting inclusions:

- The well drained Buse soils, which have less clay and more sand than the major soils and are calcareous at or near the surface; on shoulder slopes
- The well drained Poinsett soils, which have less clay and more silt than the major soils; on back slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Wind erosion, water erosion, a slow rate of water infiltration, tilth, and the high content of lime in the Nutley soil, which adversely affects the availability of plant nutrients

Management measures:

- Leaving crop residue on the surface, minimizing tillage, tilling in a timely manner, and including grasses and legumes in the cropping system help to control erosion, conserve moisture, and maintain organic matter content and tilth.
- Contour farming, terraces, and grassed waterways help to control erosion, but slopes in some areas are too short or too irregular for contour farming and terraces.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Chiseling or subsoiling when the soil is dry improves tilth and increases the rate of water infiltration.

Interpretive Groups

Land capability classification: Nutley—IIIe-3; Sinai—IIIe-3

Range site: Nutley—Clayey; Sinai—Clayey

Windbreak suitability group: Nutley—4; Sinai—4

Pasture suitability group: Nutley—I; Sinai—I

Oh—Oldham silty clay loam

Composition

Oldham and similar soils: 85 to 95 percent
 Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains

Landform position: Basins

Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 5 to 200 acres

Typical Profile

Surface layer:

0 to 8 inches—very dark gray, calcareous silty clay loam

Subsoil:

8 to 18 inches—dark gray, calcareous silty clay loam with nests of gypsum

18 to 32 inches—dark gray, mottled, calcareous silty clay loam with nests of gypsum

32 to 47 inches—gray, mottled, calcareous silty clay with nests of gypsum

Underlying material:

47 to 60 inches—grayish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Very poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: 40 to more than 60 inches over glacial till

Depth to seasonal high water table: 0.5 foot to 1.5 feet

Flooding: None

Ponding: Occasional for brief periods

Permeability: Slow

Available water capacity: High

Organic matter content: High

Surface runoff: Negligible

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Hamerly soils, which have more sand and less silt than the Oldham soil; on foot slopes
- The very poorly drained Southam soils, which are ponded for longer periods of time than the Oldham soil; in basins
- The poorly drained Vallers soils, which are dark to a depth of less than 24 inches; on toe slopes

Similar soils:

- Soils that are not calcareous

Use and Management

Rangeland or pasture

Management concerns: Wetness

Management measures:

- Proper grazing management helps to maintain plant vigor.
- Restricting grazing during wet periods helps to minimize surface compaction.
- Existing drainage systems should be maintained.

Interpretive Groups

Land capability classification: Vw-2

Range site: Wetland

Windbreak suitability group: 10

Pasture suitability group: B2

Or—Orthents, gravelly

Composition

Orthents and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains

Landform position: Excavations and spoil

Slope range: 0 to 15 percent

Shape of areas: Irregular

Size of areas: 5 to 120 acres

Typical Profile

Surface layer:

0 to 10 inches—light colored, calcareous gravelly loam

Underlying material:

10 to 60 inches—brown to light yellowish brown, calcareous gravelly sand

Soil Properties and Qualities

Drainage class: Excessively drained

Depth to bedrock: Very deep

Depth to contrasting layer: 0 to 10 inches over gravelly material

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Rapid

Available water capacity: Very low

Organic matter content: Low

Surface runoff: Slow to rapid

Inclusions

Contrasting inclusions:

- The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on back slopes
- The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on back slopes

Use and Management

Management considerations:

- These soils are generally not suited to crops, mainly because of the very low available water capacity.
- Most areas are gravel pits used mainly as a source of

sand and gravel for construction purposes. Some areas provide limited wildlife habitat.

- Abandoned gravel pits can be restored to range, tame pasture, or cropland if reclamation measures are applied.

Management measures:

- Shaping the area can reduce the slope. Mounds of overburden can be used as topsoil dressing.
- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.
- Applying fertilizer as needed helps to establish range or pasture plants.

Interpretive Groups

Land capability classification: VIIIs-1

Range site: Very Shallow

Windbreak suitability group: 10

Pasture suitability group: NS

Pa—Parnell silty clay loam

Composition

Parnell and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains

Landform position: Basins

Slope range: 0 to 1 percent

Shape of areas: Oval

Size of areas: 5 to 100 acres

Typical Profile

Surface soil:

0 to 17 inches—dark gray silty clay loam

Subsoil:

17 to 38 inches—dark gray silty clay

Underlying material:

38 to 47 inches—dark gray, calcareous clay

47 to 60 inches—light gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Very poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: 1.0 foot above to 0.5 foot below the surface

Flooding: None

Ponding: Frequent for very long periods

Permeability: Slow

Available water capacity: High

Organic matter content: High

Surface runoff: Negligible

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Cubden and Hamerly soils, which are calcareous at or near the surface; on foot slopes
- The poorly drained Vallery soils, which are calcareous at or near the surface; on toe slopes

Similar soils:

- Soils that are calcareous at the surface

Use and Management

Rangeland or pasture

Management concerns: Wetness

Management measures:

- Proper grazing management helps to maintain plant vigor.
- Restricting grazing during wet periods helps to minimize surface compaction.

Interpretive Groups

Land capability classification: Vw-2

Range site: Shallow Marsh

Windbreak suitability group: 10

Pasture suitability group: B2

Pc—Playmoor silty clay loam

Composition

Playmoor and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains

Landform position: Low flood plains

Slope range: 0 to 1 percent

Shape of areas: Irregular

Size of areas: 5 to 80 acres

Typical Profile

Surface layer:

0 to 8 inches—dark gray, calcareous silty clay loam with nests of salt

Subsoil:

8 to 25 inches—dark gray and gray, calcareous silty clay loam with nests of salt

25 to 36 inches—gray, calcareous silty clay loam with accumulations of carbonate and nests of salt

Underlying material:

36 to 57 inches—gray, calcareous silty clay loam with nests of salt

57 to 60 inches—olive gray, mottled, calcareous silty clay loam with nests of salt

Soil Properties and Qualities

Drainage class: Poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: At the surface to 1.5 feet below the surface

Flooding: Frequent for brief periods

Ponding: None

Permeability: Moderately slow

Available water capacity: High

Organic matter content: High

Surface runoff: Slow

Other properties: Salinity and a high content of lime

Inclusions

Contrasting inclusions:

- Lamoure soils, which have a lower content of visible salts than the Playmoor soil; on low flood plains
- Ludden soils, which have more clay and a lower content of visible salts than the Playmoor soil; in the slightly lower positions on the landscape

Similar soils:

- Soils that have less silt and more sand

Use and Management

Cropland and pasture

Main crops: Barley, oats, and wheat

Management concerns: Wetness, wind erosion, the high content of salt, and the high content of lime, which adversely affects the availability of plant nutrients

Management measures:

- In most years this soil is better suited to late planted crops.
- Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth, minimize surface compaction, and help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.
- Existing drainage systems should be maintained.
- Salt-tolerant crops should be planted.
- Permanent pasture or hayland species should be established.

Interpretive Groups

Land capability classification: IVw-4

Range site: Saline Subirrigated

Windbreak suitability group: 10

Pasture suitability group: J

Pm—Playmoor-Lamoure silty clay loams, channeled

Composition

Playmoor and similar soils: 40 to 55 percent

Lamoure and similar soils: 30 to 45 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains

Landform position: Low flood plains

Slope range: 0 to 2 percent

Shape of areas: Irregular

Size of areas: 10 to 80 acres

Typical Profile

Playmoor

Surface layer:

0 to 8 inches—dark gray, calcareous silty clay loam with nests of salt

Subsoil:

8 to 25 inches—dark gray and gray, calcareous silty clay loam with nests of salt

25 to 36 inches—gray, calcareous silty clay loam with accumulations of carbonate and nests of salt

Underlying material:

36 to 57 inches—gray, calcareous silty clay loam with nests of salt

57 to 60 inches—olive gray, mottled, calcareous silty clay loam with nests of salt

Lamoure

Surface soil:

0 to 28 inches—dark gray, calcareous silty clay loam

Underlying material:

28 to 56 inches—gray and light olive gray, mottled, calcareous silty clay loam

56 to 60 inches—gray, mottled, calcareous, stratified clay loam and gravelly clay loam

Soil Properties and Qualities

Drainage class: Poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: At the surface to 1.5 feet below the surface

Flooding: Frequent for brief periods

Ponding: None

Permeability: Moderately slow

Available water capacity: High

Organic matter content: High

Surface runoff: Slow

Other properties: A high content of lime in both soils, salinity in the Playmoor soil

Inclusions

Contrasting inclusions:

- Dovray soils, which have more clay than the major soils; on low flood plains

- Harriet soils, which have a sodium-affected subsoil; on the slightly lower parts of the landscape

Similar soils:

- Soils in which the dark surface layer is less than 24 inches thick

Use and Management

Rangeland

Management considerations:

- Because of the wetness and channeling, these soils are generally not suited to crops.

Management measures:

- Proper grazing management helps to maintain plant vigor.

- Restricting grazing during wet periods helps to minimize surface compaction.

Interpretive Groups

Land capability classification: Playmoor—Vlw-1;

Lamoure—Vlw-1

Range site: Playmoor—Saline Subirrigated; Lamoure—Subirrigated

Windbreak suitability group: Playmoor—10; Lamoure—2

Pasture suitability group: Playmoor—NS; Lamoure—NS

PrC—Poinsett-Rusklyn silty clay loams, 6 to 9 percent slopes

Composition

Poinsett and similar soils: 35 to 55 percent

Rusklyn and similar soils: 30 to 50 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines

Landform position: Poinsett—back slopes; Rusklyn—shoulder slopes

Slope range: 6 to 9 percent

Shape of areas: Irregular

Size of areas: 10 to 100 acres

Typical Profile

Poinsett

Surface layer:

0 to 7 inches—very dark gray silty clay loam

Subsoil:

7 to 16 inches—dark gray and dark yellowish brown silty clay loam

16 to 39 inches—light yellowish brown, calcareous silty clay loam

Underlying material:

39 to 60 inches—light yellowish brown, calcareous silty clay loam

Rusklyn

Surface layer:

0 to 9 inches—dark grayish brown, calcareous silty clay loam

Subsoil:

9 to 28 inches—light yellowish brown, calcareous silty clay loam

Underlying material:

28 to 53 inches—light yellowish brown and light gray, mottled, calcareous silty clay loam stratified with lenses of very fine sand

53 to 60 inches—light brownish gray and pale yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Very deep

Depth to contrasting layer: 40 to more than 60 inches over loamy glacial till

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Moderate

Available water capacity: High

Organic matter content: Poinsett—high; Rusklyn—moderate

Surface runoff: Medium

Other properties: A high content of lime in the Rusklyn soil

Inclusions

Contrasting inclusions:

- The well drained Egeland soils, which have less clay and more sand than the major soils; on back slopes
- The moderately well drained Waubay soils, which are dark to a depth of more than 16 inches; on foot slopes

Similar soils:

- Soils that have less silt and more sand than the Rusklyn soil
- Soils that have clay loam underlying material at a depth of 20 to 40 inches

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Poinsett—water erosion;

Rusklyn—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients

Management measures:

- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming, terraces, and grassed waterways help to control water erosion, but the slopes in some areas are too short or too irregular for contour farming and terraces.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.

Interpretive Groups

Land capability classification: Poinsett—IIIe-2; Rusklyn—IVe-2

Range site: Poinsett—Silty; Rusklyn—Thin Upland

Windbreak suitability group: Poinsett—3; Rusklyn—8

Pasture suitability group: Poinsett—F; Rusklyn—G

PsB—Poinsett-Rusklyn-Waubay silty clay loams, 1 to 6 percent slopes

Composition

Poinsett and similar soils: 35 to 50 percent

Rusklyn and similar soils: 20 to 35 percent

Waubay and similar soils: 10 to 20 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains

Landform position: Poinsett—summits and back slopes; Rusklyn—shoulder slopes; Waubay—foot slopes

Slope range: Poinsett—2 to 6 percent; Rusklyn—2 to 6 percent; Waubay—1 to 2 percent

Shape of areas: Irregular

Size of areas: 10 to 200 acres

Typical Profile

Poinsett

Surface layer:

0 to 7 inches—very dark gray silty clay loam

Subsoil:

7 to 16 inches—dark gray and dark yellowish brown silty clay loam

16 to 39 inches—light yellowish brown, calcareous silty clay loam

Underlying material:

39 to 60 inches—light yellowish brown, calcareous silty clay loam

Rusklyn*Surface layer:*

0 to 9 inches—dark grayish brown, calcareous silty clay loam

Subsoil:

9 to 28 inches—light yellowish brown, calcareous silty clay loam

Underlying material:

28 to 53 inches—light yellowish brown and light gray, mottled, calcareous silty clay loam stratified with lenses of very fine sand

53 to 60 inches—light brownish gray and pale yellow, mottled, calcareous clay loam

Waubay*Surface soil:*

0 to 12 inches—very dark gray silty clay loam

Subsoil:

12 to 23 inches—very dark grayish brown and dark grayish brown silty clay loam

23 to 36 inches—light yellowish brown, calcareous silty clay loam

Underlying material:

36 to 60 inches—light yellowish brown, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Rusklyn—well drained; Waubay—moderately well drained

Depth to bedrock: Very deep

Depth to contrasting layer: 40 to more than 60 inches over loamy glacial till

Depth to seasonal high water table: Poinsett—more than 6 feet; Rusklyn—more than 6 feet; Waubay—3.5 to 5.0 feet

Flooding: None

Ponding: None

Permeability: Moderate

Available water capacity: High

Organic matter content: Poinsett—high; Rusklyn—moderate; Waubay—high

Surface runoff: Poinsett—medium; Rusklyn—medium; Waubay—slow

Other properties: A high content of lime in the Rusklyn soil

Inclusions*Contrasting inclusions:*

- The well drained Barnes soils, which have less silt and more sand than the major soils; on back slopes

Similar soils:

- Soils that have less silt and more sand than the Rusklyn soil

- Soils that have clay loam underlying material at a depth of 20 to 40 inches

Use and Management**Cropland**

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Poinsett—water erosion; Rusklyn—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients

Management measures:

- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming and grassed waterways help to control water erosion, but the slopes in some areas are too short or too irregular for contour farming.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: Poinsett—Ile-3; Rusklyn—IIle-6; Waubay—I-3

Range site: Poinsett—Silty; Rusklyn—Thin Upland; Waubay—Loamy Overflow

Windbreak suitability group: Poinsett—3; Rusklyn—8; Waubay—1

Pasture suitability group: Poinsett—F; Rusklyn—G; Waubay—K

PwA—Poinsett-Waubay silty clay loams, 0 to 2 percent slopes**Composition**

Poinsett and similar soils: 40 to 55 percent

Waubay and similar soils: 30 to 45 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains

Landform position: Poinsett—summits and back slopes; Waubay—foot slopes

Slope range: 0 to 2 percent

Shape of areas: Irregular

Size of areas: 5 to 200 acres

Typical Profile**Poinsett***Surface layer:*

0 to 7 inches—very dark gray silty clay loam

Subsoil:

7 to 16 inches—dark gray and dark yellowish brown silty clay loam

16 to 39 inches—light yellowish brown, calcareous silty clay loam

Underlying material:

39 to 60 inches—light yellowish brown, calcareous silty clay loam

Waubay*Surface soil:*

0 to 12 inches—very dark gray silty clay loam

Subsoil:

12 to 23 inches—very dark grayish brown and dark grayish brown silty clay loam

23 to 36 inches—light yellowish brown, calcareous silty clay loam

Underlying material:

36 to 60 inches—light yellowish brown, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Waubay—moderately well drained

Depth to bedrock: Very deep

Depth to contrasting layer: 40 to more than 60 inches over loamy glacial till

Depth to seasonal high water table: Poinsett—more than 6 feet; Waubay—3.5 to 5.0 feet

Flooding: None

Ponding: None

Permeability: Moderate

Available water capacity: High

Organic matter content: High

Surface runoff: Slow

Other properties: Runoff water flows over the Waubay soil during periods of rainfall or snowmelt.

Inclusions*Contrasting inclusions:*

- The well drained Forman soils, which have less silt and more sand than the major soils; on back slopes
- The very poorly drained Parnell soils in basins
- The well drained Rusklyn soils, which are calcareous at or near the surface; on shoulder slopes

Similar soils:

- Soils that have less silt and more sand than the Poinsett soil
- Soils that have clay loam underlying material at a depth of 20 to 40 inches

Use and Management**Cropland**

Main crops: Alfalfa, barley, corn, oats, soybeans, wheat

Management concerns: Slight

Management measures:

- Managing crop residue conserves moisture and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: Poinsett—I-2; Waubay—I-3

Range site: Poinsett—Silty; Waubay—Loamy Overflow

Windbreak suitability group: Poinsett—3; Waubay—1

Pasture suitability group: Poinsett—F; Waubay—K.

PwB—Poinsett-Waubay silty clay loams, 1 to 6 percent slopes**Composition**

Poinsett and similar soils: 50 to 65 percent

Waubay and similar soils: 20 to 35 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains

Landform position: Poinsett—summits and back slopes; Waubay—foot slopes

Slope range: Poinsett—2 to 6 percent; Waubay—1 to 2 percent

Shape of areas: Irregular

Size of areas: 5 to 200 acres

Typical Profile**Poinsett***Surface layer:*

0 to 7 inches—very dark gray silty clay loam

Subsoil:

7 to 16 inches—dark gray and dark yellowish brown silty clay loam

16 to 39 inches—light yellowish brown, calcareous silty clay loam

Underlying material:

39 to 60 inches—light yellowish brown, calcareous silty clay loam

Waubay*Surface soil:*

0 to 12 inches—very dark gray silty clay loam

Subsoil:

12 to 23 inches—very dark grayish brown and dark grayish brown silty clay loam

23 to 36 inches—light yellowish brown, calcareous silty clay loam

Underlying material:

36 to 60 inches—light yellowish brown, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Waubay—moderately well drained

Depth to bedrock: Very deep

Depth to contrasting layer: 40 to more than 60 inches over loamy glacial till

Depth to seasonal high water table: Poinsett—more than 6 feet; Waubay—3.5 to 5.0 feet

Flooding: None

Ponding: None

Permeability: Moderate

Available water capacity: High

Organic matter content: High

Surface runoff: Poinsett—medium; Waubay—slow

Other properties: Runoff water flows over the Waubay soil during periods of rainfall and snowmelt.

Inclusions

Contrasting inclusions:

- The well drained Buse soils, which have less silt and more sand than the major soils and are calcareous at or near the surface; on shoulder slopes
- The well drained Forman soils, which have less silt and more sand than the major soils; on back slopes
- The well drained Rusklyn soils, which are calcareous to the surface; on shoulder slopes
- The very poorly drained Parnell soils in basins

Similar soils:

- Soils that have glacial till at a depth of 20 to 40 inches
- Soils that have less silt and more sand than the Poinsett soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Water erosion

Management measures:

- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture (fig. 9).
- Contour farming and grassed waterways help to control water erosion, but the slopes in some areas are too short or too irregular for contour farming.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: Poinsett—Ile-3; Waubay—I-3

Range site: Poinsett—Silty; Waubay—Loamy Overflow

Windbreak suitability group: Poinsett—3; Waubay—1

Pasture suitability group: Poinsett—F; Waubay—K

Ra—Ranslo-Harriet loams

Composition

Ranslo and similar soils: 40 to 55 percent

Harriet and similar soils: 35 to 45 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains

Landform position: Low flood plains

Slope range: 0 to 2 percent

Shape of areas: Long and narrow

Size of areas: 20 to 100 acres

Typical Profile

Ranslo

Surface layer:

0 to 8 inches—dark gray loam

Transitional layer:

8 to 14 inches—gray and dark gray silty clay loam

Subsoil:

14 to 24 inches—dark gray silty clay

24 to 37 inches—dark gray, calcareous silty clay with nests of salt

Underlying material:

37 to 50 inches—light yellowish brown, mottled, calcareous silty clay loam with nests of salt

50 to 60 inches—light brownish gray, mottled, calcareous silty clay

Harriet

Surface layer:

0 to 1 inch—dark gray loam with nests of salt

Subsoil:

1 to 16 inches—dark gray, calcareous silty clay with nests of salt

Underlying material:

16 to 24 inches—dark gray, calcareous clay loam with nests of salt

24 to 60 inches—olive gray and light olive gray, mottled, calcareous clay loam with nests of gypsum and other salts

Soil Properties and Qualities

Drainage class: Ranslo—somewhat poorly drained; Harriet—poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: Ranslo—at a depth of 1 to 3 feet; Harriet—at the surface to 1 foot below the surface

Flooding: Ranslo—occasional for very brief periods; Harriet—occasional for long periods

Ponding: None

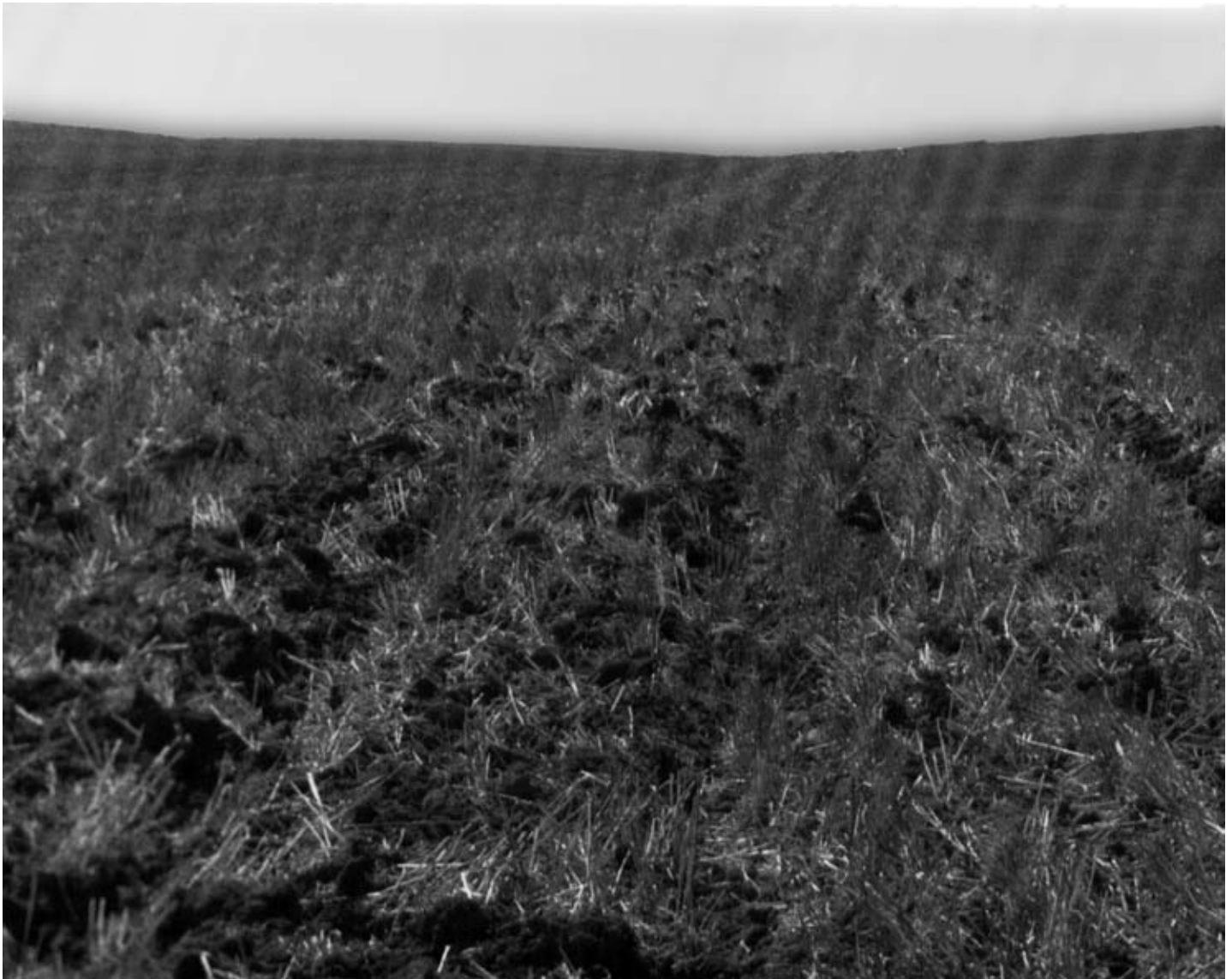


Figure 9.—A cover of crop residue left on the surface helps to control erosion in this area of Poinsett-Waubay silty clay loams, 1 to 6 percent slopes.

Permeability: Ranslo—slow; Harriet—very slow

Available water capacity: Moderate

Organic matter content: Ranslo—high; Harriet—moderate

Surface runoff: Ranslo—slow; Harriet—very slow

Other properties: A sodium-affected subsoil in both soils

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Lamoure soils, which do not have a sodium-affected subsoil; on low flood plains

- The moderately well drained Nahon soils on foot slopes

- The poorly drained Dovray soils, which do not have a sodium-affected subsoil; on toe slopes

Similar soils:

- Soils that have varved underlying material

Use and Management

Cropland

Main crops: Ranslo—alfalfa, barley, oats, and wheat; Harriet—generally not suited to crops

Management concerns: Wetness and the sodium-affected subsoil, which adversely affects crop growth by restricting the penetration of plant roots

Management measures:

- In most years these soils are better suited to late planted crops.
- Leaving crop residue on the surface, deferring tillage when the soil is wet, and including grasses and legumes in the cropping system maintain tilth and help to prevent surface compaction.
- Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: Ranslo—IVs-2; Harriet—VIs-6

Range site: Ranslo—Subirrigated; Harriet—Saline Lowland

Windbreak suitability group: Ranslo—9; Harriet—10

Pasture suitability group: Ranslo—C; Harriet—J

Rb—Rauville silty clay loam

Composition

Rauville and similar soils: 80 to 95 percent

Contrasting inclusions: 5 to 20 percent

Setting

Landform: Flood plains

Landform position: Low flood plains

Slope range: 0 to 1 percent

Shape of areas: Long and narrow

Size of areas: 10 to 500 acres

Typical Profile

Surface layer:

0 to 10 inches—dark gray, calcareous silty clay loam

Subsurface layer:

10 to 32 inches—dark gray and very dark gray, calcareous silty clay loam

Underlying material:

32 to 52 inches—gray, calcareous silt loam

52 to 60 inches—gray, calcareous clay loam

Soil Properties and Qualities

Drainage class: Very poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: 40 to more than 60 inches over gravelly material

Seasonal high water table: At the surface to 0.5 foot below the surface

Flooding: Frequent for long periods

Ponding: None

Permeability: Moderately slow

Available water capacity: High

Organic matter content: High

Surface runoff: Very slow

Inclusions

Contrasting inclusions:

- The moderately well drained Divide soils, which have gravelly material at a depth of 20 to 40 inches; on foot slopes
- The somewhat poorly drained Lamoure soils on low flood plains
- The poorly drained Marysland soils, which have gravelly material at a depth of 20 to 40 inches; on toe slopes

Use and Management

Rangeland or pasture

Management concerns: Wetness

Management measures:

- Proper grazing management helps to maintain plant vigor.

Interpretive Groups

Land capability classification: Vw-1

Range site: Wetland

Windbreak suitability group: 10

Pasture suitability group: B1

RfA—Renshaw-Fordville loams, 0 to 2 percent slopes

Composition

Renshaw and similar soils: 45 to 60 percent

Fordville and similar soils: 25 to 40 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains

Landform position: Renshaw—summits and back slopes; Fordville—foot slopes

Slope range: 0 to 2 percent

Shape of areas: Irregular

Size of areas: 10 to 500 acres

Typical Profile

Renshaw

Surface layer:

0 to 7 inches—very dark gray loam

Subsoil:

7 to 18 inches—dark grayish brown and brown loam

Underlying material:

18 to 25 inches—grayish brown, calcareous gravelly sand

25 to 60 inches—pale brown, calcareous very gravelly sand

Fordville

Surface layer:

0 to 9 inches—very dark gray loam

Subsoil:

9 to 29 inches—very dark grayish brown and dark brown loam

Underlying material:

29 to 33 inches—light brownish gray, calcareous gravelly loamy sand

33 to 60 inches—pale brown, calcareous gravelly sand

Soil Properties and Qualities

Drainage class: Renshaw—somewhat excessively drained; Fordville—well drained

Depth to bedrock: Very deep

Depth to contrasting layer: Renshaw—14 to 20 inches over gravelly material; Fordville—20 to 40 inches over gravelly material

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Renshaw—moderate in the upper part and rapid in the lower part; Fordville—moderate in the loamy sediments and rapid in the underlying gravelly material

Available water capacity: Renshaw—low; Fordville—moderate

Organic matter content: Renshaw—moderate; Fordville—high

Surface runoff: Slow

Inclusions

Contrasting inclusions:

- The moderately well drained Divide soils, which are calcareous at or near the surface; on foot slopes
- The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Renshaw—low available water capacity; Fordville—moderate available water capacity

Management measures:

- These soils are better suited to early maturing crops.
- Minimizing tillage and leaving crop residue on the surface conserve moisture.
- Including grasses and legumes in the rotation helps to

control erosion and maintains organic matter content and tilth.

- Irrigation helps to overcome the limited water storage capacity if water is of adequate quantity and quality.

Interpretive Groups

Land capability classification: Renshaw—III_s-3; Fordville—II_s-3

Range site: Renshaw—Shallow to Gravel; Fordville—Silty

Windbreak suitability group: Renshaw—6; Fordville—6

Pasture suitability group: Renshaw—D2; Fordville—D1

RfB—Renshaw-Fordville loams, 2 to 6 percent slopes

Composition

Renshaw and similar soils: 55 to 70 percent

Fordville and similar soils: 15 to 30 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains

Landform position: Renshaw—summits and back slopes; Fordville—foot slopes

Slope range: 2 to 6 percent

Shape of areas: Irregular

Size of areas: 10 to 200 acres

Typical Profile

Renshaw

Surface layer:

0 to 7 inches—very dark gray loam

Subsoil:

7 to 18 inches—dark grayish brown and brown loam

Underlying material:

18 to 25 inches—grayish brown, calcareous gravelly sand

25 to 60 inches—pale brown, calcareous very gravelly sand

Fordville

Surface layer:

0 to 9 inches—very dark gray loam

Subsoil:

9 to 29 inches—very dark grayish brown and dark brown loam

Underlying material:

29 to 33 inches—light brownish gray, calcareous gravelly loamy sand

33 to 60 inches—pale brown, calcareous gravelly sand

Soil Properties and Qualities

Drainage class: Renshaw—somewhat excessively

drained; Fordville—well drained

Depth to bedrock: Very deep

Depth to contrasting layer: Renshaw—14 to 20 inches over gravelly material; Fordville—20 to 40 inches over gravelly material

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Renshaw—moderate in the upper part and rapid in the lower part; Fordville—moderate in the loamy sediments and rapid in the underlying gravelly material

Available water capacity: Renshaw—low; Fordville—moderate

Organic matter content: Renshaw—moderate; Fordville—high

Surface runoff: Medium

Inclusions

Contrasting inclusions:

- The moderately well drained Divide soils, which are calcareous at or near the surface; on foot slopes
- The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Renshaw—low available water capacity, water erosion; Fordville—moderate available water capacity, water erosion

Management measures:

- These soils are better suited to early maturing crops, such as small grain.
- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content and tilth.
- Irrigation helps to overcome the limited water storage capacity if water is of adequate quantity and quality.

Interpretive Groups

Land capability classification: Renshaw—IVs-2; Fordville—Ile-5

Range site: Renshaw—Shallow to Gravel; Fordville—Silty

Windbreak suitability group: Renshaw—6; Fordville—6

Pasture suitability group: Renshaw—D2; Fordville—D1

RsA—Renshaw-Sioux loams, 0 to 2 percent slopes

Composition

Renshaw and similar soils: 50 to 65 percent

Sioux and similar soils: 25 to 35 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains

Landform position: Renshaw—summits and back slopes; Sioux—shoulder slopes

Slope range: Renshaw—0 to 2 percent; Sioux—1 to 2 percent

Shape of areas: Irregular

Size of areas: 10 to 100 acres

Typical Profile

Renshaw

Surface layer:

0 to 7 inches—very dark gray loam

Subsoil:

7 to 18 inches—dark grayish brown and brown loam

Underlying material:

18 to 25 inches—grayish brown, calcareous gravelly sand

25 to 60 inches—pale brown, calcareous very gravelly sand

Sioux

Surface layer:

0 to 7 inches—very dark gray loam

Transitional layer:

7 to 11 inches—dark brown, calcareous gravelly loam

Underlying material:

11 to 60 inches—light yellowish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Renshaw—somewhat excessively drained; Sioux—excessively drained

Depth to bedrock: Very deep

Depth to contrasting layer: Renshaw—14 to 20 inches over gravelly material; Sioux—6 to 14 inches over gravelly material

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Renshaw—moderate in the upper part and rapid in the lower part; Sioux—rapid

Available water capacity: Renshaw—low; Sioux—very low

Organic matter content: Renshaw—moderate; Sioux—moderately low

Surface runoff: Renshaw—slow; Sioux—very slow

Inclusions

Contrasting inclusions:

- The well drained Egeland soils, which have less clay and more sand in the surface layer than the major soils and are not underlain by gravelly material; on back slopes
- The well drained Maddock soils, which have more sand than the major soils and are not underlain by gravelly material; on shoulder slopes
- The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on back slopes

Use and Management

Cropland and pasture

Main crops: Renshaw—alfalfa, barley, oats, and wheat; Sioux—generally not suited to crops

Management concerns: Renshaw—low available water capacity; Sioux—very low available water capacity

Management measures:

- These soils are better suited to early planted crops, such as small grain.
- Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system conserve moisture and maintain the content of organic matter.
- Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Renshaw—III_s-3; Sioux—VI_s-3

Range site: Renshaw—Shallow to Gravel; Sioux—Very Shallow

Windbreak suitability group: Renshaw—6; Sioux—10

Pasture suitability group: Renshaw—D2; Sioux—NS

RsB—Renshaw-Sioux complex, 2 to 9 percent slopes

Composition

Renshaw and similar soils: 45 to 60 percent

Sioux and similar soils: 20 to 40 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains

Landform position: Renshaw—summits and back slopes; Sioux—shoulder slopes

Slope range: 2 to 9 percent

Shape of areas: Irregular

Size of areas: 5 to 500 acres

Typical Profile

Renshaw

Surface layer:

0 to 7 inches—very dark gray loam

Subsoil:

7 to 18 inches—dark grayish brown and brown loam

Underlying material:

18 to 25 inches—grayish brown, calcareous gravelly sand

25 to 60 inches—pale brown, calcareous very gravelly sand

Sioux

Surface layer:

0 to 6 inches—very dark gray, calcareous gravelly loam

Transitional layer:

6 to 9 inches—dark brown, calcareous gravelly loam

Underlying material:

9 to 60 inches—light yellowish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Renshaw—somewhat excessively drained; Sioux—excessively drained

Depth to bedrock: Very deep

Depth to contrasting layer: Renshaw—14 to 20 inches over gravelly material; Sioux—6 to 14 inches over gravelly material

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Renshaw—moderate in the upper part and rapid in the lower part; Sioux—rapid

Available water capacity: Renshaw—low; Sioux—very low

Organic matter content: Renshaw—moderate; Sioux—moderately low

Surface runoff: Renshaw—medium; Sioux—very slow

Inclusions

Contrasting inclusions:

- The moderately well drained Divide soils, which are calcareous at or near the surface; on foot slopes
- The well drained Maddock soils, which have more sand than the major soils and are not underlain by gravelly material; on shoulder slopes
- The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on back slopes

Similar soils:

- Soils that have more sand in the surface layer than the Renshaw soil

Use and Management

Cropland and pasture

Main crops: Renshaw—alfalfa, barley, oats, and wheat;
Sioux—generally not suited to crops

Management concerns: Renshaw—low available water capacity, water erosion; Sioux—very low available water capacity, water erosion

Management measures:

- These soils are better suited to early planted crops, such as small grain.
- Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system conserve moisture, control erosion, and maintain the content of organic matter.
- Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Renshaw—IVs-2; Sioux—VIs-3

Range site: Renshaw—Shallow to Gravel; Sioux—Very Shallow

Windbreak suitability group: Renshaw—6; Sioux—10

Pasture suitability group: Renshaw—D2; Sioux—NS

Ru—Ryan-Ludden complex

Composition

Ryan and similar soils: 50 to 60 percent

Ludden and similar soils: 25 to 35 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Flood plains

Landform position: Low flood plains

Slope range: 0 to 1 percent

Size of areas: 5 to 20 acres

Typical Profile

Ryan

Surface layer:

0 to 5 inches—dark gray silty clay loam

Subsoil:

5 to 10 inches—dark gray silty clay

10 to 14 inches—dark gray, calcareous silty clay with nests of salt

14 to 33 inches—dark gray and gray, calcareous silty clay

Underlying material:

33 to 60 inches—gray, calcareous silty clay

Ludden

Surface layer:

0 to 7 inches—dark gray silty clay

Subsoil:

7 to 31 inches—dark gray and gray, calcareous silty clay

31 to 52 inches—gray, calcareous silty clay with nests of gypsum and other salts

Underlying material:

52 to 60 inches—light olive gray, mottled, calcareous silty clay with nests of gypsum

Soil Properties and Qualities

Drainage class: Poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: 0.5 foot above to 1.5 feet below the surface

Flooding: Ryan—occasional for brief or long periods;
Ludden—frequent for brief or long periods

Ponding: None

Permeability: Ryan—very slow; Ludden—slow

Available water capacity: Moderate

Organic matter content: Ryan—moderate; Ludden—high

Surface runoff: Very slow

Other properties: A sodium-affected subsoil in the Ryan soil; a high content of lime in the Ludden soil

Inclusions

Contrasting inclusions:

- Lamoure soils, which have less clay and salts than the major soils; on low flood plains
- Playmoor soils, which have less clay than the major soils; on low flood plains

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, and wheat

Management concerns: Ryan—wetness, wind erosion, a slow rate of water infiltration, surface compaction if tilled when wet, and a sodium-affected subsoil, which adversely affects crop growth by restricting the penetration of plant roots; Ludden—wetness, wind erosion, a slow rate of water infiltration, and surface compaction if tilled when wet

Management measures:

- In most years these soils are better suited to late planted crops.
- Leaving crop residue on the surface and deferring tillage when the soils are wet maintain tilth and help to control wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content and tilth.
- Chiseling or subsoiling when the soils are dry increases the rate of water infiltration.
- Existing drainage systems should be maintained.

Interpretive Groups

Land capability classification: Ryan—VIs-6; Ludden—IVw-1

Range site: Ryan—Thin Claypan; Ludden—Wetland

Windbreak suitability group: Ryan—10; Ludden—10

Pasture suitability group: Ryan—NS; Ludden—B1

SaA—Sinai-Nutley silty clays, 0 to 2 percent slopes

Composition

Sinai and similar soils: 55 to 70 percent

Nutley and similar soils: 25 to 35 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Ice-walled lake plains

Landform position: Sinai—foot slopes; Nutley—shoulder slopes and back slopes

Slope range: 0 to 2 percent

Shape of areas: Irregular

Size of areas: 10 to 200 acres

Typical Profile

Sinai

Surface soil:

0 to 12 inches—very dark gray silty clay

Subsoil:

12 to 23 inches—dark gray silty clay

23 to 33 inches—light brownish gray, calcareous silty clay

33 to 42 inches—light gray, mottled, calcareous silty clay

Underlying material:

42 to 60 inches—light brownish gray, mottled, calcareous silty clay with nests of gypsum

Nutley

Surface layer:

0 to 7 inches—dark gray, calcareous silty clay

Subsoil:

7 to 20 inches—light brownish gray, calcareous clay

Underlying material:

20 to 60 inches—pale yellow, mottled, calcareous clay

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Very slow

Available water capacity: Moderate

Organic matter content: High

Surface runoff: Medium

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Cubden soils on foot slopes
- The well drained Poinsett soils, which have less clay and more silt than the major soils; on back slopes

Similar soils:

- Soils that have less clay and more silt in the surface layer than the Sinai soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Slow rate of water infiltration, wind erosion, tilth, and a high content of lime in the Nutley soil, which adversely affects the availability of plant nutrients

Management measures:

- Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system conserve moisture, control erosion, and maintain organic matter content, fertility, and tilth.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Chiseling or subsoiling when the soil is dry improves tilth and increases the rate of water infiltration.

Interpretive Groups

Land capability classification: Sinai—IIs-2; Nutley—IIs-2

Range site: Sinai—Clayey; Nutley—Clayey

Windbreak suitability group: Sinai—4; Nutley—4

Pasture suitability group: Sinai—I; Nutley—I

SbB—Sioux gravelly loamy sand, 2 to 6 percent slopes

Composition

Sioux and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains

Landform position: Shoulder slopes

Slope range: 2 to 6 percent

Shape of areas: Irregular

Size of areas: 10 to 400 acres

Typical Profile

Surface layer:

0 to 6 inches—very dark gray, calcareous gravelly loamy sand

Transitional layer:

6 to 9 inches—dark brown, calcareous gravelly sand

Underlying material:

9 to 60 inches—light yellowish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Excessively drained

Depth to bedrock: Very deep

Depth to contrasting layer: 6 to 14 inches over gravelly material

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Rapid

Available water capacity: Very low

Organic matter content: Moderately low

Surface runoff: Very slow

Other properties: Scattered stones and boulders on the surface

Inclusions

Contrasting inclusions:

- The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on back slopes
- The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on back slopes

Use and Management

Rangeland

Management concerns: Water erosion, very low available water capacity

Management measures:

- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.
- Cultivated areas should be seeded to adapted native grasses.

Interpretive Groups

Land capability classification: VIIs-3

Range site: Very Shallow

Windbreak suitability group: 10

Pasture suitability group: NS

SoB—Sioux gravelly loamy sand, 2 to 6 percent slopes, very stony

Composition

Sioux and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains

Landform position: Shoulder slopes

Slope range: 2 to 6 percent

Shape of areas: Irregular

Size of areas: 10 to 80 acres

Typical Profile

Surface layer:

0 to 6 inches—very dark gray, calcareous gravelly loamy sand

Transitional layer:

6 to 9 inches—dark brown, calcareous gravelly loamy sand

Underlying material:

9 to 60 inches—light yellowish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Excessively drained

Depth to bedrock: Very deep

Depth to contrasting layer: 6 to 14 inches over gravelly material

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Rapid

Available water capacity: Very low

Organic matter content: Moderately low

Surface runoff: Very slow

Other properties: Scattered stones and boulders on the surface

Inclusions

Contrasting inclusions:

- The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on foot slopes
- The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on back slopes

Use and Management

Rangeland

Management concerns: Stoniness, very low available water capacity, granitic rocks 1 to 3 feet in diameter covering 0.1 to 3.0 percent of the surface

Management measures:

- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: VIIIs-1

Range site: Very Shallow

Windbreak suitability group: 10
Pasture suitability group: NS

SrD—Sioux-Renshaw complex, 9 to 15 percent slopes

Composition

Sioux and similar soils: 40 to 55 percent
 Renshaw and similar soils: 35 to 45 percent
 Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Sioux—shoulder slopes; Renshaw—back slopes
Slope range: 9 to 15 percent
Shape of areas: Irregular
Size of areas: 5 to 800 acres

Typical Profile

Sioux

Surface layer:
 0 to 6 inches—very dark gray, calcareous gravelly loam
Transitional layer:
 6 to 9 inches—dark brown, calcareous gravelly loam
Underlying material:
 9 to 60 inches—light yellowish brown, calcareous very gravelly sand

Renshaw

Surface layer:
 0 to 7 inches—very dark gray loam
Subsoil:
 7 to 18 inches—dark grayish brown and brown loam
Underlying material:
 18 to 25 inches—grayish brown, calcareous gravelly sand
 25 to 60 inches—pale brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Sioux—excessively drained; Renshaw—somewhat excessively drained
Depth to bedrock: Very deep
Depth to contrasting layer: Sioux—6 to 14 inches over gravelly material; Renshaw—14 to 20 inches over gravelly material
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Sioux—rapid; Renshaw—moderate in the upper part and rapid in the lower part

Available water capacity: Sioux—very low; Renshaw—low

Organic matter content: Sioux—moderately low; Renshaw—moderate

Surface runoff: Sioux—slow; Renshaw—rapid

Inclusions

Contrasting inclusions:

- The moderately well drained Aastad soils, which are dark to a depth of more than 16 inches and are not underlain by gravelly material; on foot slopes
- The well drained Buse soils, which are not underlain by gravelly material; on shoulder slopes

Similar soils:

- Soils that are deeper to gravelly material and have more sand in the surface layer than the Sioux soil
- Soils that are dark to a depth of more than 16 inches and are deeper to gravelly material than the Renshaw soil

Use and Management

Rangeland

Management concerns: Water erosion, wind erosion, and the very low and low available water capacity

Management measures:

- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.
- Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Sioux—VIs-3; Renshaw—Vle-6

Range site: Sioux—Very Shallow; Renshaw—Shallow to Gravel

Windbreak suitability group: Sioux—10; Renshaw—10

Pasture suitability group: Sioux—NS; Renshaw—NS

SrE—Sioux-Renshaw complex, 15 to 40 percent slopes

Composition

Sioux and similar soils: 50 to 65 percent
 Renshaw and similar soils: 20 to 35 percent
 Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Sioux—shoulder slopes; Renshaw—back slopes
Slope range: Sioux—15 to 40 percent; Renshaw—15 to 25 percent
Shape of areas: Irregular
Size of areas: 10 to 400 acres

Typical Profile

Sioux

Surface layer:

0 to 6 inches—very dark gray, calcareous gravelly loam

Transitional layer:

6 to 9 inches—dark brown, calcareous gravelly loam

Underlying material:

9 to 60 inches—light yellowish brown, calcareous very gravelly sand

Renshaw

Surface layer:

0 to 7 inches—very dark gray loam

Subsoil:

7 to 18 inches—dark grayish brown and brown loam

Underlying material:

18 to 25 inches—grayish brown, calcareous gravelly sand

25 to 60 inches—pale brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Sioux—excessively drained; Renshaw—somewhat excessively drained

Depth to bedrock: Very deep

Depth to contrasting layer: Sioux—6 to 14 inches over gravelly material; Renshaw—14 to 20 inches over gravelly material

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Sioux—rapid; Renshaw—moderate in the upper part and rapid in the lower part

Available water capacity: Sioux—very low; Renshaw—low

Organic matter content: Sioux—moderately low; Renshaw—moderate

Surface runoff: Sioux—medium; Renshaw—rapid

Inclusions

Contrasting inclusions:

- The moderately well drained Aastad soils, which are dark to a depth of more than 16 inches and are not underlain by gravelly material; on foot slopes
- The well drained Buse soils, which are not underlain by gravelly material; on shoulder slopes

Similar soils:

- Soils that are dark to a depth of more than 16 inches and are deeper to gravelly material than the Renshaw soil

Use and Management

Rangeland

Management concerns: Water erosion and the very low

and low available water capacity

Management measures:

- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Sioux—VIIIs-2; Renshaw—VIe-6

Range site: Sioux—Very Shallow; Renshaw—Shallow to Gravel

Windbreak suitability group: Sioux—10; Renshaw—10

Pasture suitability group: Sioux—NS; Renshaw—NS

SsE—Sioux-Renshaw complex, 9 to 40 percent slopes, very stony

Composition

Sioux and similar soils: 50 to 65 percent

Renshaw and similar soils: 20 to 35 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines

Landform position: Sioux—shoulder slopes; Renshaw—back slopes

Slope range: Sioux—9 to 40 percent; Renshaw—9 to 25 percent

Shape of areas: Irregular

Size of areas: 10 to 200 acres

Typical Profile

Sioux

Surface layer:

0 to 6 inches—very dark gray, calcareous gravelly loam

Transitional layer:

6 to 9 inches—dark brown, calcareous gravelly loam

Underlying material:

9 to 60 inches—light yellowish brown, calcareous very gravelly sand

Renshaw

Surface layer:

0 to 7 inches—very dark gray loam

Subsoil:

7 to 18 inches—dark grayish brown and brown loam

Underlying material:

18 to 25 inches—grayish brown, calcareous gravelly sand

25 to 60 inches—pale brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Sioux—excessively drained; Renshaw—somewhat excessively drained

Depth to bedrock: Very deep

Depth to contrasting layer: Sioux—6 to 14 inches over gravelly material; Renshaw—14 to 20 inches over gravelly material

Depth to seasonal high water table: More than 6 feet

Flooding: None

Ponding: None

Permeability: Sioux—rapid; Renshaw—moderate in the upper part and rapid in the lower part

Available water capacity: Sioux—very low; Renshaw—low

Organic matter content: Sioux—moderately low; Renshaw—moderate

Surface runoff: Sioux—medium; Renshaw—rapid

Other properties: Scattered stones and boulders on the surface

Inclusions

Contrasting inclusions:

- The moderately well drained Aastad soils, which are dark to a depth of more than 16 inches and are not underlain by gravelly material; on foot slopes
- The well drained Buse soils, which are not underlain by gravelly material; on shoulder slopes

Similar soils:

- Soils that are dark to a depth of more than 16 inches and are deeper to gravelly material than the Renshaw soil

Use and Management

Rangeland

Management concerns: Sioux—water erosion, stoniness, and very low and low available water capacity; Renshaw—water erosion, stoniness, low available water capacity, and granitic rocks 1 to 3 feet in diameter covering 0.1 to 3.0 percent of the surface

Management measures:

- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Sioux—VIIIs-1; Renshaw—VIIIs-1

Range site: Sioux—Very Shallow; Renshaw—Shallow to Gravel

Windbreak suitability group: Sioux—10; Renshaw—10

Pasture suitability group: Sioux—NS; Renshaw—NS

Sw—Southam silty clay loam

Composition

Southam and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains

Landform position: Basins

Slope range: 0 to 1 percent

Shape of areas: Oval

Size of areas: 5 to 500 acres

Typical Profile

Surface layer:

0 to 7 inches—very dark gray, calcareous silty clay loam

Subsurface layer:

7 to 51 inches—dark gray, calcareous silty clay loam and silty clay

Underlying material:

51 to 60 inches—gray, mottled, calcareous silty clay

Soil Properties and Qualities

Drainage class: Very poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Seasonal high water table: 5 feet above to 1 foot below the surface

Flooding: None

Ponding: Frequent for very long periods

Permeability: Slow

Available water capacity: High

Organic matter content: Very high

Surface runoff: Negligible

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Hamerly soils, which have more sand and less silt than the Southam soil and are not ponded; on foot slopes
- The poorly drained Vallers soils, which are dark to a depth of less than 24 inches and are not ponded; on toe slopes

Similar soils:

- Soils that are not dark to a depth of 24 inches

Use and Management

Management considerations:

- Because of the wetness and ponding, this soil is generally not suited to crops.
- Areas of this soil can be maintained as wildlife habitat (fig. 10).

Interpretive Groups

Land capability classification: VIIIw-1

Range site: Not assigned

Windbreak suitability group: 10

Pasture suitability group: NS



Figure 10.—An area of Southam silty clay loam used as habitat for wetland wildlife.

To—Tonka silt loam

Composition

Tonka and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 5 to 30 acres

Typical Profile

Surface layer:

0 to 11 inches—dark gray silt loam

Subsurface layer:

11 to 17 inches—light gray, mottled silt loam

Subsoil:

17 to 42 inches—dark gray, gray, and grayish brown, mottled silty clay

Underlying material:

42 to 60 inches—light yellowish brown, mottled silty clay loam

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Seasonal high water table: 0.5 above to 1.0 foot below the surface
Flooding: None
Ponding: Frequent for long periods
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Negligible

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Cubden and Hamerly soils, which are calcareous at or near the surface; on foot slopes

Similar soils:

- Soils that have a thinner surface layer

Use and Management

Cropland

Main crops: Corn and soybeans
Management concerns: Wetness
Management measures:

- This soil is better suited to late planted crops.
- Deferring tillage when the soil is wet helps to minimize surface compaction.
- Practices that reduce runoff from adjacent soils help to control wetness.
- Existing drainage systems should be maintained.

Interpretive Groups

Land capability classification: IVw-1
Range site: Wet Meadow
Windbreak suitability group: 10
Pasture suitability group: B2

Va—Vallers loam, saline

Composition

Vallers and similar soils: 85 to 95 percent
 Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Toe slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
 0 to 7 inches—dark gray, calcareous clay loam
Subsurface layer:
 7 to 11 inches—dark gray, calcareous silty clay loam with nests of gypsum and other salts
Subsoil:
 11 to 17 inches—olive gray, mottled, calcareous silty clay loam with nests of gypsum and other salts
 17 to 26 inches—light olive gray, mottled, calcareous clay loam with nests of gypsum and other salts
Underlying material:
 26 to 60 inches—light olive gray and light gray, mottled, calcareous clay loam with nests of gypsum and other salts

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: 0.5 foot to 1.5 feet
Flooding: Rare
Ponding: None
Permeability: Moderately slow
Available water capacity: Moderate
Organic matter content: High
Surface runoff: Very slow
Other properties: Salinity and a high content of lime

Inclusions

Contrasting inclusions:

- The somewhat poorly drained Hamerly soils, which have less salt than the Vallers soil; on foot slopes
- The poorly drained Oldham and very poorly drained Parnell soils, which are dark to a depth of more than 24 inches; in basins

Similar soils:

- Soils that have less salt

Use and Management

Cropland

Main crops: Barley, oats, and wheat
Management concerns: Wind erosion, wetness, salinity, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:

- In most years this soil is better suited to late planted crops.
- Salt-tolerant crops should be planted.
- Leaving crop residue on the surface and deferring tillage when the soil is wet maintain tilth, help to prevent surface compaction, and reduce the hazard of wind erosion.
- Including grasses and legumes in the rotation helps to

control erosion and maintains organic matter content, fertility, and tilth.

- Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: IVw-4

Range site: Saline Subirrigated

Windbreak suitability group: 10

Pasture suitability group: J

Vh—Vallers-Hamerly loams

Composition

Vallers and similar soils: 55 to 70 percent

Hamerly and similar soils: 15 to 35 percent

Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains

Landform position: Vallers—toe slopes; Hamerly—foot slopes

Slope range: 0 to 2 percent

Shape of areas: Irregular

Size of areas: 10 to 200 acres

Typical Profile

Vallers

Surface layer:

0 to 6 inches—dark gray, calcareous loam

Subsurface layer:

6 to 11 inches—gray, calcareous clay loam

Subsoil:

11 to 18 inches—light brownish gray, mottled, calcareous clay loam

Underlying material:

18 to 60 inches—pale olive, mottled, calcareous clay loam with nests of gypsum

Hamerly

Surface layer:

0 to 11 inches—dark gray, calcareous loam

Subsoil:

11 to 23 inches—light brownish gray, calcareous loam
23 to 28 inches—light yellowish brown, mottled, calcareous loam

Underlying material:

28 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Vallers—poorly drained; Hamerly—somewhat poorly drained

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Depth to seasonal high water table: Vallers—0.5 foot to 1.5 feet; Hamerly—1.5 to 3.5 feet

Flooding: Vallers—rare; Hamerly—none

Ponding: None

Permeability: Moderately slow

Available water capacity: Vallers—high; Hamerly—moderate

Organic matter content: Vallers—high; Hamerly—moderate

Surface runoff: Vallers—very slow; Hamerly—slow

Other properties: A high content of lime in both soils

Inclusions

Contrasting inclusions:

- The very poorly drained Parnell soils, which are dark to a depth of more than 24 inches; in basins
- The poorly drained, calcareous Oldham soils, which are dark to a depth of more than 24 inches; in basins
- The moderately well drained Aastad soils, which are not calcareous at or near the surface; on foot slopes

Similar soils:

- Soils that have more silt and less sand
- Soils that have more salt than the Vallers soil

Use and Management

Cropland

Main crops: Alfalfa, barley, oats, and wheat

Management concerns: Wetness, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients

Management measures:

- In most years these soils are better suited to late planted crops.
- Leaving crop residue on the surface and deferring tillage when the soils are wet maintain tilth, help to prevent surface compaction, and reduce the hazard of wind erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content, fertility, and tilth.
- Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Vallers—IVw-3; Hamerly—IIs-4

Range site: Vallers—Subirrigated; Hamerly—Limy Subirrigated

Windbreak suitability group: Vallers—10; Hamerly—1

Pasture suitability group: Vallers—A; Hamerly—F

VoA—Vienna-Brookings complex, 0 to 2 percent slopes

Composition

Vienna and similar soils: 45 to 65 percent
 Brookings and similar soils: 20 to 35 percent
 Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Vienna—summits and back slopes;
 Brookings—foot slopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 150 acres

Typical Profile

Vienna

Surface layer:
 0 to 8 inches—very dark gray silt loam
Subsoil:
 8 to 17 inches—dark brown and yellowish brown silty clay loam
 17 to 23 inches—brown clay loam
 23 to 35 inches—pale yellow, calcareous clay loam
Underlying material:
 35 to 60 inches—pale yellow, calcareous clay loam

Brookings

Surface soil:
 0 to 13 inches—dark gray silty clay loam
Subsoil:
 13 to 27 inches—dark grayish brown and brown silty clay loam
 27 to 35 inches—light gray, calcareous clay loam
Underlying material:
 35 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Vienna—well drained; Brookings—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Vienna—10 to 20 inches over loamy glacial till; Brookings—20 to 40 inches over loamy glacial till
Depth to seasonal high water table: Vienna—more than 6 feet; Brookings—3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: High

Surface runoff: Slow

Other properties: Runoff water flows over the Brookings soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:

- The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on back slopes

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat

Management concerns: Slight

Management measures:

- Managing crop residue conserves moisture and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: Vienna—I-2; Brookings—I-3

Range site: Vienna—Silty; Brookings—Loamy Overflow

Windbreak suitability group: Vienna—3; Brookings—1

Pasture suitability group: Vienna—F; Brookings—K

VoB—Vienna-Brookings complex, 1 to 6 percent slopes

Composition

Vienna and similar soils: 55 to 70 percent
 Brookings and similar soils: 20 to 35 percent
 Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Vienna—summits and back slopes;
 Brookings—foot slopes
Slope range: Vienna—2 to 6 percent; Brookings—1 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 500 acres

Typical Profile

Vienna

Surface layer:
 0 to 8 inches—very dark gray silt loam
Subsoil:
 8 to 17 inches—dark brown and yellowish brown silty clay loam
 17 to 23 inches—brown clay loam
 23 to 35 inches—pale yellow, calcareous clay loam
Underlying material:
 35 to 60 inches—pale yellow, calcareous clay loam

Brookings

Surface soil:

0 to 13 inches—dark gray silty clay loam

Subsoil:

13 to 27 inches—dark grayish brown and brown silty clay loam

27 to 35 inches—light gray, calcareous clay loam

Underlying material:

35 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Vienna—well drained; Brookings—moderately well drained

Depth to bedrock: Very deep

Depth to contrasting layer: Vienna—10 to 20 inches over loamy glacial till; Brookings—20 to 40 inches over loamy glacial till

Depth to seasonal high water table: Vienna—more than 6 feet; Brookings—3 to 5 feet

Flooding: None

Ponding: None

Permeability: Moderately slow

Available water capacity: High

Organic matter content: High

Surface runoff: Vienna—medium; Brookings—slow

Other properties: Runoff water flows over the Brookings soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:

- The well drained Egeland soils, which have less clay and more sand than the major soils; on back slopes
- The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on back slopes

Similar soils:

- Soils that have more sand in the surface layer
- Soils that are deeper to the clay loam underlying material

Use and Management

Cropland

Main crops: Alfalfa, barley, oats, and wheat

Management concerns: Water erosion

Management measures:

- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming and grassed waterways help to control water erosion.
- Including grasses and legumes in the rotation helps to control erosion and maintains organic matter content and tilth.

Interpretive Groups

Land capability classification: Vienna—Ile-2; Brookings—I-3

Range site: Vienna—Silty; Brookings—Loamy Overflow

Windbreak suitability group: Vienna—3; Brookings—1

Pasture suitability group: Vienna—F; Brookings—K

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 290,000 acres in the survey area, or nearly 42 percent of the total acreage, meets the soil requirements for prime farmland. Areas of this land are throughout the county. Almost all of the prime farmland is used for crops, mainly corn, oats, alfalfa, soybeans, and wheat.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use

and management are described under the heading "Detailed Soil Map Units."

Soils that have a seasonal high water table or receive an inadequate amount of rainfall qualify as prime farmland only in areas where these limitations

have been overcome by drainage measures or irrigation. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

The soils in the survey area are assigned to various interpretive groups at the end of each map unit description and in some of the tables. The groups for each map unit also are shown in the section "Interpretive Groups," which follows the tables at the back of this survey.

Crops

Dennis Shoup, conservation agronomist, Natural Resources Conservation Service, helped prepare this section.

General management needed for crops is suggested in this section. The crops best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Natural Resources Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service, the South Dakota Cooperative Extension Service, or the South Dakota Agricultural Experiment Station.

About 62 percent of the acreage in Day County is used for cultivated crops (U.S. Department of Commerce, 1987). The major crops are corn, oats, and wheat. Alfalfa, barley, sunflowers, and soybeans are also grown. Corn and oats are grown as cash crops and for livestock feed, and alfalfa is harvested mainly for hay.

The potential of the soils in Day County for increased crop production is good. Crop production could be increased considerably by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology. The paragraphs that follow describe the management needed on the cropland in the county.

Water erosion reduces productivity and results in sedimentation. It is a hazard on soils that have slopes of more than 2 percent, such as Forman, Kranzburg, and Poinsett soils. Productivity is reduced when the more fertile surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a thin surface layer, such as Buse and Rusklyn soils. Erosion is also a concern in areas where the soils tend to be droughty, such as areas of Egeland and Renshaw soils.

Erosion on cropland can result in sedimentation of streams, lakes, and reservoirs. Measures that control erosion minimize this pollution and preserve the quality of water for fish and other wildlife and for recreational uses. Also, controlling erosion can reduce the amount of fertilizer needed in cropped areas by helping to prevent the removal of plant nutrients and of pesticides that have been applied to the soils.

Using a cropping sequence that keeps a protective cover of vegetation on the surface for extended periods can help to hold soil losses to an amount that does not reduce the productive capacity of the soils. If a plant cover is not possible, careful management of crop residue is essential. Minimizing tillage and leaving crop residue on the surface increase the rate of water infiltration, reduce the runoff rate, and help to control erosion. A conservation tillage system is one that does not invert the soil and that retains a protective amount of crop residue on the surface throughout the year. Such a system is effective in controlling both wind erosion and water erosion. Examples include no-till, strip-till, stubble mulching, and chemical fallow systems that provide for a minimum number of tillage operations. Stubble that is left standing over winter traps and holds snow until it melts and thus allows more water to sink into the soil.

Terraces and diversions reduce the runoff rate and help to control erosion by reducing the length of slopes. These measures are most practical on very deep, well drained soils that have long, smooth slopes, such as Kranzburg and Poinsett soils. Many of the soils in Day County, however, are poorly suited to terraces and diversions because the slopes are short and irregular. Grassed waterways are effective in controlling gully erosion.

Wind erosion is a slight to severe hazard on many of the soils in the county. The hazard is especially severe on soils that have a surface layer of fine sandy loam or loamy fine sand, such as Egeland and Maddock soils. Soils that have a high content of lime in the surface layer, such as Buse, Cubden, and Hamerly soils, are also susceptible to wind erosion. These soils can be damaged in a few hours if winds are strong and the soils are dry and are not protected by a cover of vegetation or surface mulch. Wind erosion can be controlled by an adequate plant cover, a cover of crop residue, stripcropping, and tillage methods that keep the surface rough. Establishing windbreaks of suitable trees and shrubs and leaving strips of unharvested crops also reduce the hazard of wind erosion.

Information about measures that control erosion on each kind of soil is provided in the Technical Guide, which is available in the local office of the Natural Resources Conservation Service.

Wetness is a major limitation on some soils in the county, including the poorly drained Ludden and Tonka soils and the somewhat poorly drained Badger and Lamoure soils. Unless they are drained, these soils are so wet that crops frequently are damaged. Open ditches can help to remove excess surface water if drainage outlets are available. Controlling the runoff from adjacent slopes also helps to overcome wetness on these soils.

The moderately well drained Aastad and Waubay soils are on foot slopes that receive runoff from adjacent uplands. In most years, drainage is adequate and crops benefit from the additional moisture. A drainage system is generally not needed on these soils. During wet years, however, the wetness delays spring planting and tillage.

Soil fertility helps to determine the yields that can be obtained from the soil. A good nutrient management program provides the nutrients needed by the designated crop for optimum yields. The kinds and amounts of fertilizer needed on Buse, Cubden, and other soils that have a high content of lime in the surface layer generally differ from the kinds and amounts needed on soils that do not have lime in the surface layer. A nutrient management plan should be based on the type of soil, the amount of available moisture, the crop to be planted, realistic yield goals, current soil fertility test levels, the inclusion of legumes in the cropping sequence within the last 2 years, applications of agricultural waste, and the vulnerability of surface water or ground water to pollution by nutrients from the site. The plan should be developed annually and should provide information regarding the amount of each nutrient needed, the form or forms in which the nutrients will be applied, the timing of applications, the method of application, and the location of the applications of nutrients. The Natural Resources Conservation Service, the South Dakota Cooperative Extension Service, or the South Dakota Agricultural Experiment Station can help in developing a nutrient management plan.

Soil tilth is an important factor in the germination of seeds and the infiltration of water into the soil. Soils that have good tilth are granular and porous. Management can influence the tilth of a specific soil. Management measures that maintain good tilth generally result in an increased rate of water infiltration, a larger water-holding capacity, and a better environment for seedling emergence and root development and thus improve crop yields. Improving soil tilth also affects the ease of tillage.

Tilth can be improved by including high-residue crops in the rotation; deferring tillage and excluding livestock from the soils during wet periods, especially in areas of

clayey soils, such as Harmony, Nutley, and Sinai soils; leaving as much crop residue as possible on or near the surface of the soil; and eliminating unnecessary tillage trips.

Field crops that are suited to the soils and climate of the area include small grain and row crops. Wheat, barley, and oats are the main small grain crops. Corn, soybeans, and sunflowers are the main row crops. Of the acreage used for corn, about one-third is used for corn for silage.

The very deep, well drained and moderately well drained soils, such as Aastad, Brookings, Forman, Kranzburg, Poinsett, and Waubay soils, are suited to all of the crops commonly grown in the county. Soils that are more susceptible to erosion, such as Egeland and Maddock soils, are better suited to high-residue crops, including small grain and alfalfa. If managed properly, these crops produce enough residue to protect fields from wind erosion. If low-residue crops, such as sunflowers, are grown or if summer fallow is practiced, other conservation practices may be needed. Such practices include field windbreaks, wind strip cropping, or no-till farming. Soils that are underlain by porous material, such as Fordville and Renshaw soils, are better suited to early maturing small grain than to deeper rooted crops, such as corn and alfalfa, because the porous underlying material restricts root development and available water capacity.

Pasture and Hayland

David W. Schmidt, range conservationist, Natural Resources Conservation Service, helped prepare this section.

Pasture land and hayland are used for the production of adapted domesticated perennial forage plants to be grazed by livestock or harvested for hay. These forage plants may be either native or introduced species and may be seeded alone or in mixtures. Generally, these species are established as part of a long-term forage program, but in some areas legumes or grasses have been established as part of a short-term crop rotation.

About 8 percent of the county is classified as pasture and hayland (U.S. Department of Commerce, 1987). This acreage supplies a major portion of the forage for livestock. It includes areas that formerly supported native vegetation but have been invaded by introduced tame grasses, such as smooth brome grass, because of overgrazing in the past. Managing these areas as native rangeland is no longer practical in many cases. Because of overgrazing, improper management, and poor agronomic practices, much of the pasture or hayland is presently producing well below its potential.

Proper management of pasture and hayland is needed to obtain sustained maximum yields. Proper

stocking rates allow the pasture plants to retain their vigor. Overgrazing results in depletion of the root systems of the pasture plants. If continued overgrazing is allowed, the plants will eventually die and be replaced by less desirable species and weeds. A planned grazing system that includes periods of adequate rest or deferment for the key pasture species improves plant vigor and thus improves production. Harvesting hay crops at the proper stage of plant growth also helps to maintain plant vigor. Generally, the plants should be harvested at early or mid bloom stage. Grazing pasture species at the proper stage of growth also increases production. The plants should not be grazed before it has produced enough leaf material to replenish stored energy reserves. Generally, the plants should be allowed to grow to a height of 8 to 14 inches before they are grazed. The proper height depends on the species being managed. If the plants become too tall or mature before grazing is allowed, the quality and quantity of the forage can be affected. Also, allowing the plants to regrow before the first killing frost provides adequate energy reserves for survival through the winter and for the initiation of regrowth in the spring.

Pasture and hayland species can be divided into two broad categories. Cool-season species begin their growth in the early spring and reach maturity in early summer. If soil moisture is adequate, they may regrow in the fall when temperatures cool. Warm-season species begin growth in the early summer. They produce most of their forage during the hot summer months. Cool-season plants include smooth brome grass, intermediate wheatgrass, and alfalfa. Warm-season species include big bluestem and switchgrass. Selecting a warm-season species will ensure a productive, nutritious forage source for livestock during July and August. Using a cool-season species during this same period would produce less forage.

Proper management includes periodic reestablishment of pasture and hayland. The length of time that pasture and hayland remain productive depends on the plant species, the type of soil, climatic factors, and management techniques. Generally, many of the tame species should be replaced every 5 to 10 years. Native species that are adapted to the site generally remain productive for an extended period of time, depending on the kind of management applied. Species selection should be based on the type of soil and on producer needs. Using improved varieties can result in increased production, improved forage quality, and stand establishment and longevity.

Maintaining soil fertility is an important management concern. Applications of fertilizer should be based on the results of soil tests. Care should be taken to prevent

the contamination of water supplies. Proper levels of fertilization can increase production, increase the longevity of the stand, and improve the quality of forage. Planting legumes, such as alfalfa, in combination with grasses can increase the nitrogen level and thus help to meet the nutrient needs of grass species.

Weeds can be a problem if proper management techniques are not applied. Allowing overgrazing, selecting species that are not adapted to the site, and failing to maintain soil fertility can increase the extent of weeds in areas of pasture and hayland.

At the end of each map unit description and in the section "Interpretive Groups," the soil has been assigned to a pasture suitability group. These groups are based primarily on the suitability of the soil for certain pasture or hayland species, management needs, and potential productivity. The principal criteria for assigning a soil to a pasture suitability group include depth, drainage class, texture, structure, permeability, available water capacity, landscape position, and special internal features. Detailed interpretations for each pasture suitability group in the county are provided in the Technical Guide, which is available in the local office of the Natural Resources Conservation Service. General descriptions of the pasture suitability groups in this county are provided in the following paragraphs. The descriptions include limitations affecting the use of the soils for pasture or hayland and a list of suitable plant species. The species are selected based on yield potential, adaptability to the site, palatability, and relative ease of establishment.

Group A.—The soils in this group receive additional moisture from runoff or flooding. All climatically adapted grasses and legumes are suitable, but only plants that are capable of utilizing the extra moisture are recommended.

The soils in this group are artificially drained or have a water table that is seasonally high for only short periods. Examples are Badger, Colvin, Lamoure, Lowe, Mauvais, Minnewasta, Minnewaukan, and Vallers soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, creeping foxtail, indiangrass, intermediate wheatgrass, reed canarygrass, smooth brome, orchardgrass, and switchgrass. Maintaining plant vigor is the major management concern. Proper grazing use, including deferred grazing and timely harvesting, helps to maintain plant vigor. Applications of fertilizer may also be needed. Surface compaction may be a concern during wet periods. Deferring use during these periods helps to minimize compaction.

Group B1.—The soils in this group receive additional moisture from runoff or flooding. Because of the excess

moisture, the selection of climatically adapted grasses is limited to water-tolerant species.

The soils in this group are not artificially drained and do not have a water table that is seasonally high for prolonged periods. Examples are Ludden, Marysland, and Rauville soils. The species that are most suitable in areas of these soils include creeping foxtail and reed canarygrass. The main management concern is surface compaction, which can result from harvesting or grazing during periods when the soils are saturated. Deferring grazing or haying during these periods can minimize compaction and improve plant vigor.

Group B2.—The soils in this group receive additional moisture from runoff. Because of the excess moisture, the selection of climatically adapted grasses is limited to water-tolerant species.

The soils in this group are not artificially drained. Examples are Dovray, Oldham, Parnell, and Tonka soils. The species that are most suitable in areas of these soils include creeping foxtail and reed canarygrass. The major management concern is surface compaction, which can result from harvesting or grazing during periods when the soils are saturated. Deferring grazing or haying during these periods can minimize compaction and improve plant vigor.

Group C.—The soils in this group have a claypan subsoil and typically have a high content of soluble salts in the lower part of the subsoil and in the underlying material. The restricted root zone limits the selection and productivity of climatically adapted grasses and legumes.

Soils in this group include Cavour, Nahon, and Ranslo soils. The species that are most suitable in areas of these soils include alfalfa, crested wheatgrass, green needlegrass, intermediate wheatgrass, pubescent wheatgrass, smooth brome, and western wheatgrass. The major management concerns are the accumulation of excess salts, surface compaction during wet periods, and a slow rate of water infiltration. Proper grazing use, deferred grazing, and proper hayland management are needed to maintain a healthy plant community. Additions of fertilizer may also be needed.

Group D1.—The soils in this group have a moderately deep root zone and a limited available water capacity, which restrict the selection of climatically adapted grasses and legumes.

The soils in this group are excessively drained to somewhat poorly drained and are moderately deep over sand and gravel. Divide and Fordville soils are examples. The somewhat poorly drained soils and some of the moderately well drained soils have a water table that is seasonally high for short periods and are calcareous at or near the surface. The species that are

most suitable in areas of these soils include alfalfa, intermediate wheatgrass, and smooth brome grass. The major management concerns are overcoming droughtiness, which is caused by the limited available water capacity, and maintaining plant vigor. Applications of fertilizer may also be needed. Proper hayland management and proper grazing use, including deferred grazing or a planned grazing system, help to maintain plant vigor.

Group D2.—The soils in this group have a shallow root zone and a very low available water capacity, which limit the selection of climatically adapted grasses.

The soils in this group are excessively drained to moderately well drained and are shallow over sand and gravel. Arvilla and Renshaw soils are examples. The species that are most suitable in areas of these soils include crested wheatgrass and pubescent wheatgrass. Maintaining the plant community can be difficult because of the extreme droughtiness and the shallow root zone. Proper grazing use, deferred grazing, a planned grazing system, and timely harvesting help to maintain plant vigor.

Group E.—The soils in this group contain a high content of soluble salts in the underlying material. The unfavorable root zone limits the selection and productivity of climatically adapted grasses and legumes.

The soils in this group include Aberdeen, Cresbard, and Harmony soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, green needlegrass, indiangrass, intermediate wheatgrass, smooth brome grass, and switchgrass. The major management concerns are maintaining plant vigor and maintaining soil tilth. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to maintain tilth. Applications of fertilizer may also be needed.

Group F.—The soils in this group are suited to all climatically adapted grasses and legumes, but bunch-type grass species are not recommended in areas where the slope is 6 percent or more.

The soils in this group include Barnes, Bearden, Cubden, Eckman, Edgeley, Forman, Great Bend, Hamerly, Hetland, Kranzburg, Poinsett, Putney, Rondell, and Vienna soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, green needlegrass, indiangrass, intermediate wheatgrass, smooth brome grass, and switchgrass. The major management concerns are maintaining plant vigor and maintaining soil tilth. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to maintain tilth. Applications of fertilizer may also be needed.

Group G.—The soils in this group are calcareous

within a depth of 10 inches. They range from gently sloping to moderately steep. The selection and productivity of climatically adapted grasses and legumes are limited by the slope, the high content of lime, and the hazard of erosion.

The soils in this group include Buse, Huffton, Rusklyn, and Zell soils. The species that are most suitable in areas of these soils include alfalfa, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, and smooth brome grass. The major management concerns are maintaining plant vigor and controlling erosion. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to control erosion. Applications of fertilizer may also be needed.

Group H.—The soils in this group are susceptible to erosion. Also, a limited available water capacity restricts the selection and productivity of climatically adapted grasses and legumes.

The soils in this group include Egeland, Embden, and Maddock soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, indiangrass, intermediate wheatgrass, smooth brome grass, and switchgrass. The major management concerns are maintaining plant vigor and controlling erosion. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to control erosion. Applications of fertilizer may also be needed.

Group I.—The soils in this group have an unfavorable root zone and a very slow rate of water infiltration, which limit the selection and productivity of climatically adapted grasses and legumes.

The soils in this group include Nutley and Sinai soils. The species that are most suitable in areas of these soils include alfalfa, green needlegrass, intermediate wheatgrass, smooth brome grass, switchgrass, and big bluestem. The major management concerns are maintaining plant vigor and maintaining soil tilth. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to maintain tilth. Applications of fertilizer may also be needed.

Group J.—The soils in this group are characterized by excessive salinity and alkalinity, which severely limit the selection and productivity of climatically adapted grasses and legumes.

The soils in this group include Harriet, Holmquist, Playmoor, and Ryan soils and the saline Ludden and Vallery soils. The species that are most suitable in areas of these soils include tall wheatgrass and western wheatgrass. The major management concern is maintaining the desirable plant community. Proper grazing use, deferred grazing, a planned grazing

system, and proper hayland management help to maintain plant vigor and ensure the survival of the stand.

Group K.—The soils in this group receive additional moisture from runoff. They are suited to all of the climatically adapted grasses and legumes.

The soils in this group include Aastad, Beotia, Brookings, Gardena, La Prairie, and Waubay soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, creeping foxtail, indianguass, intermediate wheatgrass, reed canarygrass, smooth brome grass, and switchgrass. The major management concerns are maintaining plant vigor and maintaining soil tilth. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to maintain tilth. Applications of fertilizer may also be needed.

Group NS.—The soils in this group are generally not suitable for pasture or hayland plantings because they are very shallow to gravel, are sandy and have a low content of organic matter, are very strongly saline or alkaline, are clayey and have a dense subsoil, are stony or very stony, or are subject to ponding.

The soils in this group are mainly shallow to very deep. Examples are Exline, Ferney, Kloten, Langhei, Sioux, and Southam soils.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include a cropping sequence that allows the efficient use of available moisture, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and other essential elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are

likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the South Dakota Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for pasture, hayland, and rangeland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (USDA, 1961). These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have

limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, *Ile*. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class *I* there are no subclasses because the soils of this class have few limitations. Class *V* contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class *V* are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, *Ile-4* and *IIle-6*.

The capability classification of the map units in this survey area is given in the section "Detailed Soil Map Units" and in the section "Interpretive Groups," which follows the tables at the back of this survey.

Rangeland

David W. Schmidt, range conservationist, Natural Resources Conservation Service, helped prepare this section.

Rangeland supports native vegetation suitable for grazing or browsing. It includes areas where native vegetation has been reestablished. The vegetation is mainly grasses, grasslike plants, forbs, or shrubs. The amounts and kinds of native vegetation in any one area are determined by the soil, topography, climate, past use, and management.

All of the survey area was rangeland before the first permanent settlers arrived. Currently, about 20 percent of the county supports native vegetation (Baumberger, 1977). This rangeland supplies a portion of the forage for livestock in the county. Approximately 61 percent of the farm and ranch income in the county is derived from the sale of livestock and livestock products (U.S. Department of Commerce, 1987). Most of the livestock enterprises are cow-calf operations. Some are yearling operations, and some combine cow herds with yearlings. This latter practice permits greater flexibility

in adjusting livestock numbers during periods of drought. Sheep are raised in limited numbers throughout the county and are often run in combinations with cow herds. The rangeland is generally grazed from May to October. The forage provided by rangeland is generally supplemented by crop aftermath and tame pasture plants, such as intermediate wheatgrass and smooth brome grass. In winter the forage is supplemented by protein concentrate and hay.

Day County is part of the tall grass prairie. The native vegetation is dominated by tall and mid grasses and forbs. Common tall grass species include big bluestem, switchgrass, and prairie dropseed. Mid grasses include little bluestem, sideoats grama, and needlegrasses. Goldenrod and prairie-clover are common forbs. The tall grass prairie consists of cool- and warm-season plants, which provide high-quality forage throughout the growing season. The cool-season plants grow mostly during April, May, and June and include such plants as porcupinegrass. The warm-season plants grow mostly during June, July, and August and include such plants as big bluestem. The cool-season grasses may start growing again in September and October if rainfall is adequate.

The native vegetation in many parts of the county is producing below its potential because of past management. The tall grasses and some of the mid grasses have been replaced by less desirable plants. In many areas of the county, the past misuse of the native vegetation has resulted in an invasion of cool-season tame grasses, such as smooth brome grass and Kentucky bluegrass. As a result, the amount of available forage is reduced. In most areas, however, enough of the original plants remain for the reestablishment of high-quality native plants if good grazing management practices are applied.

Range Sites and Condition Classes

Different kinds of soil vary in their capacity to produce native vegetation. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important. Soils that produce approximately the same kinds, amounts, and proportions of native vegetation make up a range site. The potential native vegetation on a range site is the stabilized plant community that the site is capable of producing. It consists of the plants that were growing on the site when the region was settled. This plant community maintains itself and changes very little as long as the environment remains unchanged. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be

determined directly from the soil map.

The plants within the native plant community are sometimes grouped as decreasers, increasers, and invaders, depending on their response to grazing pressure. Decreasers are plants that respond to overgrazing by decreasing in abundance. They generally are the most productive plants and the ones most preferred by the grazing animals. Increasers are plants that respond to grazing pressure, at least initially, by increasing in amount as the more desirable decreaser plants become less abundant. Increasers generally are less productive and less preferred by the grazing animal. Invaders are plants that are not part of the original plant community but invade because of some kind of disturbance or continued overgrazing. Some invader plants have little or no value for grazing.

Because plants do not respond in the same manner to different influences, a plant may be a decreaser on some range sites but an increaser on others. A cool-season plant, for example, may be a decreaser if the site is grazed only during the spring but would be an increaser if the same site were grazed only during the summer. The reverse would be true for the warm-season plants. Restricting grazing to the spring would cause the warm-season plants to increase in abundance, and restricting grazing to the summer would cause them to decrease.

Table 7 shows, for nearly all of the soils, the range site; the composition of species in the potential natural plant community; and the potential annual production of vegetation in favorable, average, and unfavorable years. *Potential annual production* is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaf, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, average, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperature make growing conditions substantially better than average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Range management maintains the capacity of the rangeland to produce forage for livestock and game animals and to provide wildlife habitat, water, and

watershed protection. The primary objective of good range management is to keep the rangeland in excellent or good condition. The main management concern is responding to important changes in the plant community of a range site.

Range condition is determined by comparing the present vegetation on a range site with the potential native plant community for the site. Four range condition classes are recognized. The range site is in excellent condition if 76 to 100 percent of the present vegetation is the same kind as the potential native vegetation. It is in good condition if the percentage is 51 to 75, in fair condition if the percentage is 26 to 50, and in poor condition if the percentage is 25 or less. The potential production depends on the range site, the range condition, and the moisture available to plants during the growing season.

Measures that maintain or improve the range condition are needed on all of the rangeland in the county. Such measures include proper stocking rates and rotation or deferred rotation grazing systems. These systems provide rest periods that maintain or improve the vigor of the key plants. Good range management also includes range seeding, fencing, and measures that provide water for livestock.

The soils in the county are assigned to 17 different range sites. These range sites are described in the following paragraphs.

Clayey range site. The potential native vegetation is a mixture of tall and mid grasses interspersed with a variety of forbs. Big bluestem and little bluestem, which are warm-season grasses, make up about 50 percent of the vegetation in about equal proportions. Needlegrasses and western wheatgrass are the dominant cool-season grasses. They make up about 25 percent of the vegetation. Other grasses that occur in lesser amounts include sideoats grama, blue grama, and grasslike sedges. Forbs, such as sageworts, heath aster, false boneset, and yarrow, are common but generally make up less than 10 percent of the vegetation.

The major management concern on this site is maintaining the most productive grasses. Big bluestem, little bluestem, and needlegrasses rapidly lose their productive capacity after continued overgrazing because of their palatability to livestock. If overgrazing is allowed, western wheatgrass, sideoats grama, and blue grama increase in abundance. If overgrazing continues, bluegrasses and blue grama become dominant and the production of short grasses is limited. The most productive grasses can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing program, which provides

rest periods during the key growing season of these plants.

Claypan range site. The potential native vegetation is a prairie of mid and tall grasses interspersed with some forbs. Western wheatgrass and green needlegrass, which are cool-season species, are codominant species. They make up about 55 percent of the vegetation. Big bluestem and switchgrass, which are warm-season species, make up approximately 15 percent of the vegetation. Blue grama and sedges are common understory grasses but occur in small amounts. Forbs, such as sageworts, heath aster, and scarlet globemallow, occur on this site but make up less than 10 percent of the vegetation.

The major management concern on this site is maintaining the most productive plants. Big bluestem, switchgrass, and green needlegrass rapidly decrease in abundance after continuous overgrazing because of their palatability to livestock. Western wheatgrass initially increases in abundance, but if overgrazing continues this species is replaced by short grasses, such as blue grama and bluegrasses. The most productive grasses can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing program, which provides rest periods during the key growing season of these plants.

Limy Subirrigated range site. The potential native vegetation on this site is an excellent stand of warm-season, tall and mid grasses. Big bluestem and little bluestem, which are warm-season grasses, make up about 60 percent of the vegetation. Cool-season needlegrasses make up about 20 percent of the vegetation. Blue grama, bluegrasses, and sedges are in the understory. Forbs are common but never dominant. This site is less productive than the Subirrigated site because of the seasonal high water table and the high content of lime in the soils.

The major management concern on this site is maintaining the extent of the most productive grasses. Big bluestem loses its productive capacity and thins out after continuous grazing because it is preferred by livestock. As the extent of this species decreases, the extent of little bluestem and sideoats grama initially increases. After continuous overgrazing, however, bluegrasses, sedges, and downy brome become the principal plants on the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Loamy Overflow range site. The potential native

vegetation on this site is tall, warm-season prairie grasses. Big bluestem makes up about 60 percent of the vegetation. Warm-season, mid grasses, such as little bluestem and sideoats grama, make up about 10 percent. Sedges and bluegrasses are in the understory. Forbs, such as Maximilian sunflower, stiff sunflower, tall gayfeather, and goldenrod, and shrubs, such as leadplant and wild rose, are present on the site but are not dominant.

The major management concern on this site is maintaining the extent of the most productive grasses and forbs. Big bluestem, switchgrass, Maximilian sunflower, and stiff sunflower lose their productive capacity and thin out after continuous grazing because the livestock prefer these plants. As the extent of these plants decreases, the extent of little bluestem and sideoats grama initially increases. After continuous overgrazing, however, bluegrass, a short, cool-season grass, becomes the principal plant on the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of these plants.

Saline Lowland range site. The climax plant community is made up of species that have a tolerance for salinity. Cordgrasses commonly dominate the site and may make up as much as 55 percent of the vegetation. Nuttall alkaligrass, switchgrass, and western wheatgrass are also common grasses on this site. Saltgrass is the most abundant short grass. Grasses generally are not dominant and make up a rather small percentage of the vegetation both separately and as a group. Sedges and forbs, such as seepweed and glasswort, occur in small amounts. Woody plants are rare on this site. The soils on this site commonly have a water table within a depth of 1 to 4 feet.

Within areas of this site are small areas that do not have a water table high enough to support cordgrasses. In these areas, the percentage of cordgrass is lower and the percentages of other species are higher than in most areas of this range site.

The major management concern on this site is maintaining the most productive grasses. If continued overgrazing is allowed, cordgrass and Nuttall alkaligrass rapidly lose vigor and density and saltgrass increases and becomes the principal grass on the site. Because saltgrass is less productive and less palatable in most seasons than other species, forage production on the site is greatly reduced. The most productive grasses can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing program,

which provides rest periods during the key growing season of these plants.

Saline Subirrigated range site. The potential native vegetation on this site is an excellent stand of warm-season, tall and mid grasses. Little bluestem makes up about 45 percent of the vegetation. Big bluestem makes up 20 percent; indiagrass, 10 percent; switchgrass, 10 percent; and sedges and forbs, 10 percent.

The major management concern on this site is maintaining the extent of the most productive plants. The plant community is very fragile. Big bluestem, little bluestem, indiagrass, and switchgrass rapidly lose their productive capacity and thin out after continuous grazing because livestock prefer these plants. As the extent of these plants decreases, inland saltgrass and foxtail barley become the principal plants on the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Sandy range site. The potential native vegetation on this site is dominated by tall and mid, warm-season grasses. Big bluestem, sand bluestem, prairie sandreed, and switchgrass make up about 50 percent of the vegetation. Sideoats grama and little bluestem make up about 30 percent. Needleandthread and porcupinegrass, which are cool-season grasses, make up about 10 percent. Forbs, such as heath aster, scurfpea, and perennial sunflowers, make up about 5 percent. Shrubs, such as wild rose and leadplant, occur on the site but are not dominant.

The major management concern on this site is maintaining the extent of the most productive grasses. The extent of big bluestem, sand bluestem, and porcupinegrass decreases after continuous grazing because the livestock prefer these plants. The extent of prairie sandreed, needleandthread, little bluestem, and sideoats grama initially increases as that of the other grasses decreases. After continuous overgrazing, these grasses thin out and are replaced by blue grama and bluegrasses. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of these plants.

Shallow range site. The potential native vegetation on this site is a mixture of warm- and cool-season mid grass species. Little bluestem is the dominant warm-

season species. It makes up about 35 percent of the vegetation. Other warm-season grasses on this site include sideoats grama and blue grama. These species make up about 20 percent of the vegetation. Needlegrasses are the dominant cool-season species. They make up about 25 percent of the vegetation. Other cool-season grasses and grasslike species include western wheatgrass and sedges. These species make up about 15 percent of the vegetation. Forbs, such as blacksamson, dotted gayfeather, and prairie-clover, make up about 5 percent of the vegetation. Shrubs, such as leadplant and wild rose, occur on the site but are not dominant.

The major management concern on this site is maintaining the extent of the most productive grasses. Little bluestem and needlegrasses lose their productive capacity and thin out after continuous overgrazing because the livestock prefer these plants. The extent of western wheatgrass and sideoats grama initially increases. If overgrazing continues, these mid grasses will be replaced by the short grasses, such as blue grama and buffalograss. The grasslike species, such as threadlead sedge, also increase. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of these plants.

Shallow Marsh range site. This site is ponded in spring and early summer. The potential native vegetation is water-tolerant, tall prairie grasses and sedges. Rivergrass and sedges make up about 75 percent of the vegetation. American mannagrass, cordgrasses, and reedgrass make up about 15 percent. Forbs, such as smartweed and waterplantain, make up about 10 percent.

The major management concern on this site is maintaining the extent of the most productive plants. If continued overgrazing is allowed, rivergrass and slough sedge are replaced by spike sedge and other grasslike plants, which are less palatable to livestock. An increase in the abundance of the less palatable vegetation results in a loss of available forage. The extent of the most productive plants can be maintained by using proper stocking rates and by using a deferred grazing program, which provides rest periods during the key growing season of these plants.

Shallow to Gravel range site. The potential native vegetation on this site is mid prairie grasses. Needleandthread, which is a cool-season grass, makes up about 45 percent of the vegetation. Warm-season grasses make up about 50 percent. They include little

bluestem, plains muhly, and prairie dropseed, which make up 25 percent of the vegetation, and blue grama and hairy grama, which make up 10 percent. Sedges, forbs, and shrubs also make up about 10 percent of the vegetation.

The major management concern on this site is maintaining the extent of the most productive grasses. Needleandthread, little bluestem, plains muhly, and prairie dropseed rapidly thin out if overgrazing is allowed. When the extent of these grasses decreases, the extent of sedges and blue grama or hairy grama increases. If overgrazing continues, the productivity of the site is greatly reduced. The extent of the most productive grasses can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing program, which provides rest periods during the key growing season of these plants.

Silty range site. The potential native vegetation on this site is tall and mid grasses and a large number of forbs. Cool-season grasses make up about 20 percent of the vegetation. They include green needlegrass and porcupinegrass. Warm-season grasses, such as little bluestem, big bluestem, and prairie dropseed, make up about 55 percent of the vegetation. Forbs, such as blacksamson, dotted gayfeather, stiff sunflower, heath aster, and prairie-clover, and shrubs, such as leadplant, rose, and western snowberry, make up about 10 percent.

The major management concern on this site is maintaining the extent of the most productive grasses. If overgrazing is allowed, the extent of big bluestem, prairie dropseed, porcupinegrass, and green needlegrass decreases because the livestock prefer these plants. Little bluestem and sideoats grama initially increase after continuous grazing. If continuous overgrazing is allowed, however, short grasses, such as blue grama, annual bromes, and bluegrasses, become the dominant plants. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Subirrigated range site. The potential native vegetation on this site is dominantly tall, warm-season grasses. Big bluestem is the dominant warm-season grass. It makes up about 50 percent of the vegetation. Prairie cordgrass, switchgrass, indiangrass, and little bluestem make up about 35 percent. Forbs, such as American licorice, Maximilian sunflower, downy gentian, Canada milkvetch, heath aster, and Missouri goldenrod, make up about 5 percent.

The major management concern on this site is maintaining the extent of the most productive tall grasses. After continuous grazing, the extent of big bluestem, indiangrass, switchgrass, and forbs, such as Maximilian sunflower, decreases because the livestock prefer these plants. Little bluestem, sideoats grama, and sedges initially increase after continuous grazing. After continuous overgrazing, however, short grasses, such as bluegrasses, downy brome, and sedges, become the dominant plants. Low forage production is the result. The extent of the most productive tall grasses can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing program, which provides rest periods during the key growing season of these plants.

Thin Claypan range site. The potential native vegetation on this site is a mixture of mid and short grasses. Western wheatgrass is the principal mid grass. It makes up about 55 percent of the vegetation. Blue grama is the principal short grass. It makes up about 25 percent of the vegetation. Buffalograss, saltgrass, and sedges also occur but in smaller amounts. Forbs, such as sageworts, heath aster, broom snakeweed, and woody plantain, generally make up about 5 percent or less of the vegetation. Pricklypear is the dominant shrub, but it makes up only a small portion of the plant community.

The major management concern on this site is maintaining the most productive grasses. If overgrazing is allowed, western wheatgrass is replaced by blue grama, buffalograss, and saltgrass. Continued overgrazing results in a considerable amount of bare ground, especially during dry periods, and in an abundance of weeds during wet periods. The most productive grasses can be maintained by using the proper stocking rates and by using a rotation grazing or deferred grazing program, which provides rest periods during the key growing season of these plants.

Thin Upland range site. The potential native vegetation on this site consists of tall and mid grasses and a large number of forbs. Warm-season grasses make up 60 percent of the vegetation. These include little bluestem, which makes up 35 percent of the vegetation; prairie dropseed and big bluestem, which make up 20 percent; and sideoats grama, which makes up 5 percent. Cool-season grasses, such as green needlegrass, porcupinegrass, and needleandthread, make up about 20 percent. Forbs, such as pasqueflower, dotted gayfeather, and blacksamson, and woody plants, such as leadplant and rose, make up about 10 percent.

The major management concern on this site is

maintaining the extent of the most productive grasses. Prairie dropseed, big bluestem, and porcupinegrass lose their productive capacity and thin out after continuous grazing because the livestock prefer these plants. The extent of little bluestem, sideoats grama, and needleandthread initially increases as the other grasses thin out. After continuous overgrazing, short grasses, such as blue grama, dominate the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Very Shallow range site. The potential native vegetation on this site is mid and short grasses. Needleandthread, plains muhly, and sideoats grama are the dominant mid grasses. These species make up about 65 percent of the vegetation. Short grasses, such as blue grama and hairy grama, and sedges make up about 30 percent. Forbs, such as dotted gayfeather, blacksamson, and sagewort, make up about 5 percent. Shrubs, such as leadplant and wild rose, occur in smaller amounts.

The main management concern on this site is maintaining a good stand of grasses. If overgrazing is allowed, the site rapidly deteriorates to a stand of grama grasses, threadleaf sedge, and a few unpalatable forbs. If overgrazing continues, the stand of short grasses may thin out and much of the site is subject to erosion. A productive cover of grasses can be maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Wetland range site. This range site has the potential to produce a luxuriant stand of grasses that tolerate a high water table. Because these sites are often under water during the spring, their use is limited to summer and fall. Prairie cordgrass is the dominant species. It makes up about 60 percent of the vegetation. Reedgrasses, reed canarygrass, switchgrass, Canada wildrye, bluegrasses, and sedges also grow on this site. They make up about 40 percent of the vegetation. Forbs, such as asters, waterhemlock, and giant goldenrod, and shrubs, such as indigo amorphia and willows, generally occur in small amounts.

The major management concern on this site is maintaining the most productive plants. If continued overgrazing is allowed, the climax grasses lose vigor and density and sedges, rushes, bluegrasses, and saltgrass increase or invade. A less productive plant

community results. The most productive grasses can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing system, which provides rest periods during the key growing season of these plants.

Wet Meadow range site. This range site has the potential to produce a luxuriant stand of sedges and mid or tall grasses. Sedges are the dominant species. They make up about 40 percent of the vegetation. Tall grass species, such as reedgrasses, prairie cordgrass, and reed canarygrass, make up about 40 percent of the vegetation. Mid grasses, such as western wheatgrass and bluegrasses, grow on the site but are not dominant. Forbs, such as smartweed, aster, and milkweed, are common but generally make up only about 5 percent of the vegetation. A few willows may occur.

The major management concern on this site is maintaining the most productive grasses and sedges. The site may not be available for use by livestock during the spring and early summer because the surface is frequently ponded for about 4 to 8 weeks following snowmelt or heavy rains. Surface compaction can be a problem if livestock are allowed to graze on this site during wet periods. If continued overuse is allowed, tall grasses and the more palatable sedges decrease; the less palatable sedges, such as spike sedge, and rushes increase; and weedy grasses, such as foxtail barley, invade. Forage production is thus greatly reduced. The most productive grasses and sedges can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing program, which provides rest periods during the key growing season of these plants. Deferring grazing until after areas of this range site have dried out helps to prevent surface compaction.

Native Woodland, Windbreaks, and Environmental Plantings

Thomas A. Hurford, resource conservationist, Natural Resources Conservation Service, helped prepare this section.

Native trees and shrubs grow on about 3,000 acres in Day County. The soils that support trees and shrubs are not classified as woodland soils but as grassland soils that formed under grassland vegetation. Prior to settlement of the survey area, periodic fires prevented the widespread establishment of trees and shrubs. Trees and shrubs have now been established in some areas.

There are two primary areas within the county that support native trees and shrubs. One is adjacent to the lakes, in the eastern part of the county. The major soils are Sioux, Buse, Forman, and Aastad soils. The other area includes the major drainageways from the western

aspect of the Coteau, in the extreme southwestern part of the county. The major soils in this area are Buse and Barnes soils.

Tree species associated with Sioux, Buse, Forman, and Aastad soils adjacent to the lakes include green ash, bur oak, hackberry, boxelder, chokecherry, western snowberry, American plum, smooth sumac, American elm, slippery elm, basswood, false indigo, and prickly ash. The wetter areas adjacent to the lakes and depressional areas and wet draws support peachleaf willow, sandbar willow, and eastern cottonwood.

The drainageways associated with the Coteau in the southwestern part of the county support mainly green ash. American elm once grew in these areas but has been eliminated by Dutch elm disease. Western snowberry, American plum, and chokecherry also grow in these areas.

There are no perennial streams in the county and, therefore, no native woodland areas that are normally associated with such streams.

Russian-olive, an introduced species, grows in areas of Holmquist soils. These soils are slightly saline. Because Russian-olive is tolerant of saline conditions, this species can thrive in these areas.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. They protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife. They may consist of one or more rows of adapted trees and shrubs.

Farmstead and feedlot windbreaks are planted to protect buildings and livestock from the severe winter weather that is common in Day County. In addition, these plantings provide winter cover for wildlife. They also help to beautify and screen houses and other buildings and to abate noise. Farmstead or feedlot windbreaks generally consist of multiple rows of a combination of adapted trees and shrubs. Many of the older plantings in the county have been neglected and are in need of renovation. Renovation may include planting additional trees adjacent to the existing windbreaks and controlling grasses within the older windbreaks. Competition from grass species, such as smooth brome grass, is a major factor contributing to the decline of windbreaks within the county. Competition from unwanted species can be controlled with herbicides or tillage.

To ensure plant survival, locally adapted planting stock should be used and planted in a properly prepared site. If possible, the site should be one on which summer fallowing was practiced during the year prior to planting. Table 8 shows suitable tree and shrub species for plantings as well as the expected 20-year height of the species on the various soils in the county.

At the end of each description under the heading "Detailed Soil Map Units" and in the section "Interpretive Groups," which follows the tables in the back of the survey, the soils are assigned to windbreak suitability groups. A windbreak suitability group is a distinctive group of soils that supports trees and shrubs having similar growth and survival rates if weather conditions are normal and the windbreak is properly managed. The relationship between the soils and the growth of trees and shrubs was ascertained during this survey. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the growth of trees and shrubs. Soil reaction, salt content, and a seasonal high water table also are important. The windbreak suitability groups in this survey area are described in the following paragraphs.

Group 1. The soils in this group are well suited to woody plantings. They are on foot slopes and high flood plains. They receive additional moisture from runoff and flooding. Some areas are subirrigated. All climatically suited trees and shrubs grow well.

This group consists mainly of loamy, silty, and clayey, somewhat poorly drained to well drained soils that are deep and very deep. Available water capacity is moderate or high. The fine sandy loams and loamy fine sands are subject to severe wind erosion. Typical soils in this group are Aastad, Brookings, Cubden, Divide, Hamerly, La Prairie, and Waubay soils.

Group 2. The soils in this group are well suited to woody plantings. They are on toe slopes and low flood plains. They receive additional moisture from runoff or have a high water table within the root zone. All climatically suited trees and shrubs grow well.

This group consists of deep and very deep, sandy, silty, loamy, and clayey, poorly drained and somewhat poorly drained soils. Available water capacity is high. The sandy loams and loamy fine sands are subject to severe wind erosion. Typical soils in this group are Badger, Lamoure, and Minnewaukan soils.

Group 3. The soils in this group are well suited to woody plantings. They are on summits, back slopes, and foot slopes. Except for those trees and shrubs that require abundant moisture, all climatically suited trees and shrubs grow well.

This group consists of deep and very deep, loamy and silty, well drained soils. Available water capacity is moderate or high. The susceptibility to water erosion ranges from slight in the nearly level areas to severe in the strongly sloping areas. The susceptibility to wind erosion ranges from slight to severe. Typical soils in this group are Aastad, Barnes, Beotia, Forman, Great

Bend, Hetland, Kranzburg, Poinsett, Putney, and Vienna soils.

Group 4. The soils in this group are fairly well suited to woody plantings. They are on summits, shoulder slopes, back slopes, and foot slopes. Most of the climatically suited trees and shrubs grow well; however, maximum growth is not possible because of limited root development.

This group consists of moderately deep, deep, and very deep, clayey soils and clayey soils that have a surface layer of loamy and silty material. The soils are moderately well drained and well drained. Available water capacity is low or moderate in the more clayey soils and moderate or high in the silty and loamy soils. Soils having accumulations of salts in the lower part of the subsoil also are in this group. The clayey soils are subject to severe wind erosion. The moderately sloping and strongly sloping soils are subject to severe water erosion. Typical soils in this group are Aberdeen, Cresbard, Harmony, Nutley, and Sinai soils.

Group 5. The soils in this group are well suited to woody plantings. They are on summits, shoulder slopes, and back slopes. All climatically suited trees and shrubs grow well, except those that require abundant moisture.

This group consists mainly of deep and very deep, loamy and sandy, well drained and somewhat excessively drained soils. Available water capacity generally is low or moderate. These soils are subject to severe or very severe wind erosion. Typical soils in this group are Egeland and Maddock soils.

Group 6. The soils in this group are poorly suited to woody plantings. They are on summits, back slopes, and foot slopes. No trees or shrubs grow well on the soils in this group. Plantings can be established, but optimum survival and growth should not be expected. Field windbreaks are not effective because of the slow growth rate and the low height at maturity.

This group consists of silty and loamy, well drained and somewhat excessively drained soils that are moderately deep to bedrock or are shallow or moderately deep to sand and gravel. Available water capacity is low or moderate. The moderately sloping and strongly sloping soils are subject to severe erosion. Typical soils in this group are Arvilla, Edgeley, Fordville, and Renshaw soils.

Group 7. The soils in this group are poorly suited to woody plantings. No trees or shrubs grow well. Coniferous trees and shrubs are better suited than deciduous trees and shrubs. Plantings can be established, but optimum survival and growth should

not be expected. Field windbreaks are not effective because of the slow growth rate and the low height at maturity.

This group consists of moderately deep, deep, and very deep, sandy, somewhat excessively drained and excessively drained soils. Available water capacity is very low or low. These soils are subject to very severe wind erosion. None of the soils in Day County are assigned to this group.

Group 8. The soils in this group are poorly suited to woody plantings. They are on shoulder slopes and foot slopes. No trees or shrubs grow well. Plantings can be established, but optimum survival and growth should not be expected. Field windbreaks are not effective because of the slow growth rate and the low height at maturity.

This group consists of moderately deep, deep, and very deep, loamy and silty, well drained soils that contain enough calcium carbonate at or near the surface to adversely affect the growth and survival of trees and shrubs. Available water capacity is moderate or high. These soils are subject to severe wind erosion and water erosion. Typical soils in this group are Buse, Huffton, Rondell, Rusklyn, and Zell soils.

Group 9. The soils in this group are poorly suited to woody plantings. They have a dense claypan subsoil and an excess amount of salt in the lower part of the subsoil. They are on summits, back slopes, and foot slopes. No trees or shrubs grow well because of the adverse effect of the dense claypan subsoil and the salts.

This group consists of deep and very deep, silty and loamy, moderately well drained soils. Available water capacity is low or moderate. Typical soils in this group are Cavour, Nahon, and Ranslo soils.

Group 10. The soils in this group generally are unsuited to woody plantings. The soils are shallow to bedrock, very shallow to gravel, very saline, very alkaline, stony, or very wet. Specialized plantings for wildlife, recreation, or beautification may be established in some areas. The most favorable sites should be selected, and only those trees and shrubs that have the best potential to survive and grow should be planted.

The soils in this group have a wide range of texture, depth, drainage, available water capacity, permeability, and slope characteristics. Susceptibility to water erosion and wind erosion ranges from slight to very severe. Typical soils in this group are the saline Aquent, the gravelly Orthents, and Barnes, Buse, Colvin, Dovray, Exline, Ferney, Harriet, Holmquist, Klotten, Langhei, Lowe, Ludden, Marysland, Mauvais, Minnewasta,

Oldham, Parnell, Rauville, Renshaw, Sioux, Southam, Tonka, and Vallers soils.

Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local offices of the Natural Resources Conservation Service or the South Dakota Cooperative Extension Service or from a commercial nursery.

Recreation

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes

and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife Habitat

Connie M. Vicuna, biologist, Natural Resources Conservation Service, helped prepare this section.

Day County provides a variety of wildlife habitat types, including rangeland, cropland, and wetlands. Common species of wildlife include white-tailed deer, gray partridge, dove, cottontail rabbit, squirrels, pheasants, ducks, geese, other waterfowl, beaver, mink, muskrats, fox, coyote, raccoons, and skunks. Prairie chickens and sharptail grouse also inhabit areas of the county. Also, fisheries are associated with the abundant lakes and streams.

The Waubay National Wildlife Refuge, on the Coteau des Prairies in the northeastern part of the county, provides habitat for waterfowl and other wildlife. The United States Fish and Wildlife Service and the South Dakota Game, Fish, and Parks Department own and manage several tracts of land for the production of waterfowl and wildlife.

Prairie pothole wetlands are abundant in most of the county. There are also a few wetland areas on the flood plains along streams that flow from the western slopes of the Coteau des Prairies. Wetlands range in size from less than 0.1 acre to more than 1,000 acres. Water regimes in the county are also variable and include temporary and permanent bodies of water. The variety and number of wetland areas are extremely attractive to waterfowl. Ducks, geese, grebes, herons, and other

waterbirds inhabit the survey area from spring through fall.

The steep, rolling hills of the Coteau des Prairies support rangeland habitat. Grasslands in these areas and the numerous intermixed wetlands provide the necessary habitat for the production of waterfowl and make the survey area a nationally important area for such production. Rangeland also provides habitat for sharptail grouse and prairie chickens.

Woody habitat is available in areas near the many lakes and on adjacent slopes. These areas are not abundant, but during part of the year they provide important shrubby and woody vegetation for food and cover for many species of wildlife.

Soils affect the kind and amount of vegetation that is available for wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing specific elements of wildlife habitat. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining the habitat elements; and in determining the intensity of management needed for each habitat element.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element. The element can be established, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element are very severe and that unsatisfactory results can be expected. Establishing, improving, or maintaining the element is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. They are primarily food sources for wildlife, but small grain crops also provide some nesting cover. Soil properties and features that

affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, sorghum, wheat, and oats.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. They provide nesting and roosting cover. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are intermediate wheatgrass, brome grass, and alfalfa.

Native herbaceous plants are native or naturally established grasses and forbs, including weeds. They provide food, nesting cover, and escape cover. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of native herbaceous plants are big bluestem, switchgrass, indiangrass, green needlegrass, and sideoats grama.

Planted woody plants include trees and shrubs that require cultivation before and during establishment. These plants provide fruit, buds, twigs, bark, and foliage and are important as food sources, nesting cover, winter cover, and escape cover. Soil properties and features that affect the growth of these plants include depth of the root zone, available water capacity, salinity, and soil moisture. Examples of planted woody plants are green ash, hackberry, caragana, plum, chokecherry, Rocky Mountain juniper, and eastern redcedar.

Native deciduous trees and woody understory produce nuts or other fruit, buds, twigs, bark, and foliage. They provide food for wildlife and are important as winter cover and escape cover. Soil properties and features that affect the growth of these trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are elm, cottonwood, ash, bur oak, willow, plum, and chokecherry.

Native coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Eastern redcedar is the primary example of these plants in the survey area.

Native shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil

moisture. Examples of shrubs are gooseberry, snowberry, and sumac.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. They provide food and nesting cover. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, cattails, sloughgrass, whitetop, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

Additional information concerning maintaining and managing specific wildlife species is available at the local office of the Natural Resources Conservation Service; the South Dakota Department of Game, Fish, and Parks; or the United States Fish and Wildlife Service.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be

considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are

required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, stone content, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, and shrinking and swelling can cause the movement of footings. A high water table, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Sanitary Facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features

are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, and large stones:

Excessive seepage resulting from rapid permeability

in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of groundwater pollution. Ease of excavation and revegetation should be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good*, *fair*, or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of about 5 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications

for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Reaction and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding;

slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by the cropping system, the depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a

combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are established or maintained in permanent vegetation and are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 11). "Loam," for example, is soil that is

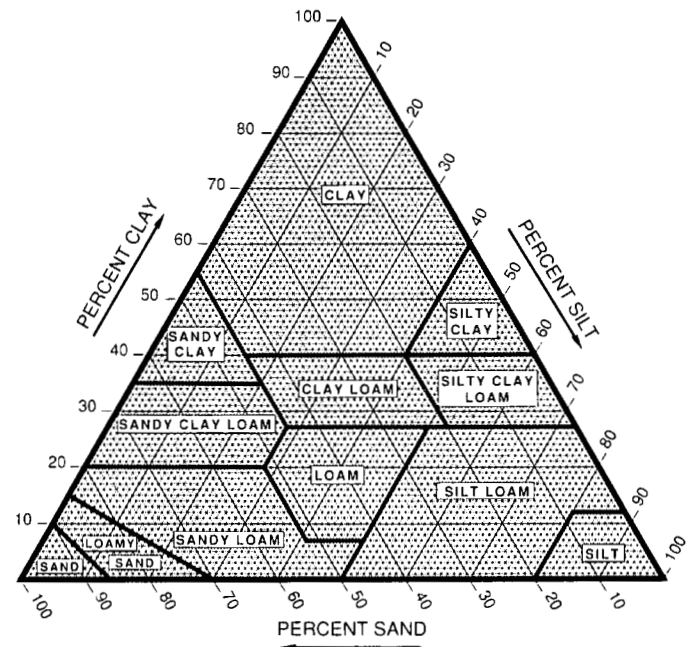


Figure 11.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1993) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and

clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and plasticity index (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (oven-dry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $\frac{1}{3}$ -bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields, in the design and management of irrigation systems, and in the development of nutrient and pesticide management plans.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown, in the selection of tillage systems, in decisions regarding crop residue management, and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and

is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, in selecting pesticides, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. In Day County, they range mainly from 0.17 to 0.37. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

- 4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by limiting residue removal

operations, by including high-residue crops in the rotation, and by applying agricultural waste to the soil. Organic matter affects the available water capacity, infiltration rate, pesticide efficiency and persistence, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep to very deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 17, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as

none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or

special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of

corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1975). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Boroll (*Bor*, meaning cool, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haploborolls (*Hapl*, meaning minimal horizonation, plus *boroll*, the suborder of the Mollisols that has a cool temperature regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. An example is Udic Haploborolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and

other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed Udic Haploborolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (USDA, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (USDA, 1975). Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Aastad Series

Depth to bedrock: Very deep

Drainage class: Moderately well drained

Permeability: Moderately slow

Landform: Till plains and moraines

Parent material: Loamy glacial till

Slope: 0 to 6 percent

Typical Pedon

Aastad loam, in an area of Forman-Buse-Aastad loams, 1 to 6 percent slopes, 100 feet north and 2,100 feet west of the southeast corner of sec. 21, T. 122 N., R. 56 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; about 3 percent pebbles; slightly acid; abrupt smooth boundary.

A—7 to 14 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; about 3 percent pebbles; slightly alkaline; clear smooth boundary.

Bw1—14 to 23 inches; dark grayish brown (10YR 4/2) clay loam, very dark brown (10YR 2/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; about 3 percent pebbles; slightly alkaline; clear smooth boundary.

Bw2—23 to 29 inches; light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/3) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; about 3 percent pebbles; slightly alkaline; clear smooth boundary.

Bk—29 to 38 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; few fine distinct brown (7.5YR 5/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, firm, slightly sticky and slightly plastic; common medium and fine accumulations of carbonate; about 5 percent pebbles; strong effervescence; moderately alkaline; gradual smooth boundary.

C—38 to 60 inches; olive yellow (2.5Y 6/6) clay loam, light olive brown (2.5Y 5/4) moist; common medium distinct strong brown (7.5YR 5/8) mottles; massive; slightly hard, firm, slightly sticky and slightly plastic; about 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 24 inches

Depth to carbonates: 18 to 40 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 45 to more than 60 inches

A horizon:

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1

Texture—loam or clay loam

Bw horizon:

Hue—2.5Y or 10YR

Value—3 to 5 (2 to 4 moist)

Chroma—2 to 4

Texture—clay loam

Bk horizon:

Hue—2.5Y

Value—5 to 7 (4 to 6 moist)

Chroma—2 to 4

Texture—clay loam

C horizon:

Hue—2.5Y or 5Y

Value—5 to 7 (4 to 6 moist)

Chroma—2 to 4

Texture—clay loam or loam

Aberdeen Series

Depth to bedrock: Very deep

Drainage class: Moderately well drained

Permeability: Slow

Landform: Lake plains

Parent material: Clayey glaciolacustrine sediments

Slope: 0 to 2 percent

Typical Pedon

Aberdeen silt loam, in an area of Nahon-Aberdeen-Exline silt loams, 2,570 feet east and 130 feet south of the northwest corner of sec. 30, T. 124 N., R. 59 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; moderate fine granular structure; slightly hard, friable, slightly sticky; common very fine roots; moderately acid; abrupt smooth boundary.

BE—8 to 12 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; gray (10YR 6/1) silt coatings on faces of peds; weak medium subangular blocky structure parting to weak medium and thin platy; slightly hard, friable, slightly sticky; common very fine roots; slightly acid; clear wavy boundary.

Bt1—12 to 22 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate medium and fine

angular blocky; hard, firm, sticky and plastic; common very fine roots; shiny films on faces of peds; neutral; clear wavy boundary.

Bt_n2—22 to 29 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate medium prismatic structure parting to strong fine and very fine angular blocky; hard, firm, sticky and plastic; common very fine roots; shiny films on faces of peds; neutral; clear wavy boundary.

Bt_n3—29 to 37 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to strong medium and fine angular blocky; hard, firm, sticky and plastic; common very fine roots; shiny films on faces of peds; neutral; clear wavy boundary.

Bk_z—37 to 45 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parting to moderate medium and fine angular blocky; hard, firm, sticky and plastic; few very fine roots; common fine nests of gypsum and other salts; strong effervescence; slightly alkaline; gradual wavy boundary.

C1—45 to 53 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; strong effervescence; slightly alkaline; gradual wavy boundary.

C2—53 to 60 inches; light gray (2.5Y 7/2) silty clay loam, light yellowish brown (2.5Y 6/4) moist; common fine prominent yellowish brown (10YR 5/6) mottles; massive; slightly hard, friable, slightly sticky; varves 1 to 5 millimeters thick; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 30 inches

Thickness of the surface soil: 0 to 12 inches

Depth to carbonates: 16 to 40 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 25 to more than 60 inches

A horizon:

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1

Texture—silt loam and silty clay loam

BE horizon:

Hue—10YR

Value—4 or 5 (3 or 4 moist)

Chroma—1 or 2

Texture—silty clay loam or silt loam

Bt_n horizon:

Hue—10YR or 2.5Y

Value—3 to 5 (2 to 4 moist)

Chroma—1 to 3

Texture—silty clay, silty clay loam, or clay

Bk_z horizon:

Hue—2.5Y or 5Y

Value—5 to 7 (3 to 5 moist)

Chroma—1 to 4

Texture—silty clay loam, silty clay, or silt loam

C horizon:

Hue—2.5Y or 5Y

Value—5 to 8 (4 to 6 moist)

Chroma—2 to 4

Texture—silt loam, silty clay loam, or varved very fine sand to clay

Arvilla Series

Depth to bedrock: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Landform: Outwash plains

Parent material: Loamy sediments over glacial outwash

Slope: 2 to 6 percent

Typical Pedon

Arvilla sandy loam, 2 to 6 percent slopes, 125 feet west and 1,540 feet south of the northeast corner of sec. 28, T. 122 N., R. 53 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) sandy loam, black (10YR 2/1) moist; weak medium granular structure parting to single grain; soft, very friable; common fine and very fine roots; about 5 percent gravel; neutral; abrupt smooth boundary.

Bw1—8 to 16 inches; very dark gray (10YR 3/1) sandy loam, black (10YR 2/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; soft, very friable, slightly sticky and slightly plastic; few fine and very fine roots; about 5 percent gravel; neutral; clear wavy boundary.

Bw2—16 to 19 inches; very dark grayish brown (10YR 3/2) sandy loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few fine and very fine roots; about 5 percent gravel; slightly alkaline; abrupt smooth boundary.

2C1—19 to 30 inches; grayish brown (10YR 5/2) gravelly coarse sand, dark grayish brown (10YR 4/2) moist; single grain; loose; about 25 percent gravel; strong effervescence; moderately alkaline; clear smooth boundary.

2C2—30 to 60 inches; brown (10YR 5/3) coarse sand, brown (10YR 4/3) moist; single grain; loose; about

10 percent gravel; slight effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches

Depth to carbonates: 14 to 20 inches

Depth to contrasting or impervious layer: 14 to 25 inches over gravelly material

Depth to gypsum and other salts: More than 60 inches

Other features: A Bk or 2Bk horizon in some pedons

A horizon:

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1

Texture—sandy loam, coarse sandy loam, loam, or fine sandy loam

Bw horizon:

Hue—7.5YR, 10YR, or 2.5Y

Value—3 to 5 (2 to 5 moist)

Chroma—1 to 4

Texture—mainly sandy loam, coarse sandy loam, loam, or fine sandy loam; loamy sand in some pedons

2C horizon:

Hue—10YR or 2.5Y

Value—4 to 7 (3 to 6 moist)

Chroma—2 to 4

Texture—sand, coarse sand, loamy sand, or loamy coarse sand

Badger Series

Depth to bedrock: Very deep

Drainage class: Somewhat poorly drained

Permeability: Slow

Landform: Till plains

Parent material: Local clayey alluvium

Slope: 0 to 2 percent

Typical Pedon

Badger silty clay loam, in an area of Cubden-Badger silty clay loams, 1,200 feet north and 410 feet west of the southeast corner of sec. 5, T. 122 N., R. 56 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; hard, friable, sticky and plastic; common fine roots; neutral; abrupt smooth boundary.

Bt1—10 to 24 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; strong medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, very sticky and

very plastic; shiny films on faces of peds; few fine roots; neutral; gradual wavy boundary.

Bt2—24 to 30 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, very sticky and very plastic; shiny films on faces of peds; few fine roots; neutral; clear wavy boundary.

BC—30 to 38 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; hard, firm, very sticky and very plastic; few dark gray (10YR 4/1) tongues; slightly alkaline; clear wavy boundary.

Cg—38 to 60 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; common fine and medium prominent yellowish brown (10YR 5/6) mottles; massive; hard, firm, sticky and plastic; few nests of gypsum; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 36 inches

Depth to carbonates: 35 to more than 60 inches

Depth to contrasting or impervious layer: 40 to more than 60 inches over glacial till

Depth to gypsum and other salts: 45 to more than 60 inches

A horizon:

Hue—10YR, 2.5Y, or neutral

Value—3 or 4 (2 or 3 moist)

Chroma—0 or 1

Texture—silty clay loam, silt loam, clay loam, or loam

Bt horizon:

Hue—10YR, 2.5Y, or 5Y

Value—3 to 6 (2 to 5 moist)

Chroma—1 or 2

Texture—mainly clay or silty clay; silty clay loam or clay loam in some pedons

Cg horizon:

Hue—2.5Y or 5Y

Value—5 to 7 (4 to 6 moist)

Chroma—1 to 6

Texture—silty clay loam, clay loam, sandy clay loam, loam, or silt loam

Barnes Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Till plains and moraines

Parent material: Loamy glacial till

Slope: 2 to 25 percent

Typical Pedon

Barnes loam, in an area of Buse-Barnes loams, 9 to 20 percent slopes, 1,125 feet west and 245 feet south of the northeast corner of sec. 22, T. 122 N., R. 53 W.

A—0 to 6 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak medium granular; slightly hard, friable; many fine roots; about 3 percent pebbles; neutral; clear smooth boundary.

Bw—6 to 13 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; about 3 percent pebbles; neutral; clear smooth boundary.

Bk—13 to 32 inches; light brownish gray (2.5Y 6/2) clay loam, olive brown (2.5Y 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; few fine roots; common medium accumulations of carbonate; about 5 percent pebbles; violent effervescence; moderately alkaline; gradual wavy boundary.

C—32 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; massive; hard, firm, sticky and plastic; few fine accumulations of carbonate; about 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches

Depth to carbonates: 10 to 20 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1 or 2

Texture—loam, fine sandy loam, sandy loam, clay loam, sandy clay loam, or silt loam

Bw horizon:

Hue—10YR or 2.5Y

Value—3 to 6 (2 to 5 moist)

Chroma—2 to 4

Texture—loam, clay loam, or sandy clay loam

Bk horizon:

Hue—10YR or 2.5Y

Value—5 to 8 (4 to 6 moist)

Chroma—2 to 4

Texture—loam or clay loam

C horizon:

Hue—10YR or 2.5Y

Value—4 to 7 (4 to 6 moist)

Chroma—2 to 4

Texture—loam or clay loam

Bearden Series

Depth to bedrock: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderate to slow

Landform: Lake plains

Parent material: Silty glaciolacustrine sediments

Slope: 0 to 2 percent

Typical Pedon

Bearden silt loam, 890 feet north and 80 feet west of the southeast corner of sec. 10, T. 127 N., R. 60 W., in Brown County:

Ap—0 to 8 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak medium and fine subangular blocky structure parting to weak fine and very fine granular; slightly hard, friable; common very fine roots; strong effervescence; slightly alkaline; abrupt smooth boundary.

ABk—8 to 12 inches; gray (10YR 5/1) silt loam, dark gray (10YR 4/1) moist; weak medium and fine subangular blocky structure parting to weak fine and very fine granular; slightly hard, friable; common very fine roots; common medium and fine accumulations of carbonate; strong effervescence; slightly alkaline; clear wavy boundary.

Bk—12 to 26 inches; light gray (5Y 7/1) silt loam, olive gray (5Y 5/2) moist; weak coarse subangular blocky structure parting to weak medium subangular blocky; hard, friable, sticky and plastic; few very fine roots; violent effervescence; slightly alkaline; gradual wavy boundary.

Bkz—26 to 39 inches; light gray (5Y 7/2) silt loam, olive (5Y 5/3) moist; common fine prominent strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure parting to weak medium subangular blocky; slightly hard, friable; many fine nests and crystals of salts; violent effervescence; moderately alkaline; gradual wavy boundary.

C—39 to 60 inches; pale yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; many medium prominent yellowish brown (10YR 5/6) mottles; massive; soft, very friable; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches

Depth to carbonates: 0 to 7 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 26 to more than 60 inches

Other features: Some pedons do not have an ABk horizon. Some pedons are varved with silt, very fine sand, or silty clay at a depth of more than 40 inches.

A horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 to 5 (2 or 3 moist)

Chroma—0 or 1

Texture—silt loam or silty clay loam

Bk horizon:

Hue—10YR, 2.5Y, or 5Y

Value—5 to 7 (3 to 7 moist)

Chroma—1 to 4

Texture—silt loam or silty clay loam

C horizon:

Hue—2.5Y, 5Y, or neutral

Value—5 to 8 (4 to 7 moist)

Chroma—0 to 4

Texture—silt loam or silty clay loam

Beotia Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Moderate in the upper part, moderate to slow in the lower part

Landform: Lake plains

Parent material: Silty glaciolacustrine sediments

Slope: 0 to 2 percent

Typical Pedon

Beotia silt loam, in an area of Beotia-Rondell silt loams, 0 to 3 percent slopes, 2,379 feet north and 324 feet east of the southwest corner of sec. 7, T. 124 N., R. 59 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak medium and fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; neutral; abrupt smooth boundary.

A—7 to 10 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak coarse and medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; neutral; clear wavy boundary.

Bw1—10 to 18 inches; grayish brown (10YR 5/2) silt loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to weak medium

subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; neutral; clear wavy boundary.

Bw2—18 to 24 inches; grayish brown (10YR 5/2) silt loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; neutral; clear wavy boundary.

Bk—24 to 35 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; weak coarse and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; strong effervescence; moderately alkaline; gradual wavy boundary.

C1—35 to 46 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—46 to 54 inches; light gray (2.5Y 7/2) silty clay loam, light brownish gray (2.5Y 6/2) moist; many fine prominent brownish yellow (10YR 6/6) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; strong effervescence; moderately alkaline; clear wavy boundary.

C3—54 to 60 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; varves 1 to 3 millimeters thick; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 30 inches

Depth to carbonates: 16 to 30 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 30 to more than 60 inches

A horizon:

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1

Texture—silt loam

Bw horizon:

Hue—10YR or 2.5Y

Value—4 to 6 (2 to 4 moist)

Chroma—1 to 3

Texture—silt loam or silty clay loam

Bk horizon:

Hue—10YR or 2.5Y

Value—5 to 8 (4 to 6 moist)

Chroma—2 to 4

Texture—silt loam or silty clay loam

C horizon:

Hue—2.5Y

Value—6 to 8 (4 to 6 moist)

Chroma—2 to 4

Texture—mainly silt loam or silty clay loam; varved
very fine sand to clay in some pedons**Brookings Series***Depth to bedrock:* Very deep*Drainage class:* Moderately well drained*Permeability:* Moderately slow*Landform:* Till plains*Parent material:* Loess or silty glacial till over loamy
glacial till*Slope:* 0 to 2 percent**Typical Pedon**

Brookings silt loam, in an area of Kranzburg-Brookings silt loams, 0 to 2 percent slopes, 75 feet south and 1,310 feet west of the northeast corner of sec. 22, T. 124 N., R. 58 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; moderate medium and fine granular structure; slightly hard, friable, slightly plastic; common fine roots; slightly acid; abrupt smooth boundary.

A—8 to 13 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly plastic; common fine roots; slightly acid; clear wavy boundary.

Bw1—13 to 21 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly plastic; few fine roots; neutral; clear wavy boundary.

Bw2—21 to 27 inches; brown (10YR 5/3) silt loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; neutral; clear wavy boundary.

2Bk—27 to 35 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common medium accumulations of carbonate; about 5 percent pebbles; violent effervescence; moderately alkaline; gradual wavy boundary.

2C—35 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; common fine prominent yellowish brown (10YR 5/6) mottles; massive; hard, firm, slightly sticky and slightly

plastic; few fine accumulations of carbonate; about 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics*Thickness of the mollic epipedon:* 16 to 25 inches*Depth to carbonates:* 20 to 36 inches*Depth to contrasting or impervious layer:* 20 to 40 inches
over loamy glacial till*Depth to gypsum and other salts:* More than 60 inches*Other features:* A Bk or C horizon in some pedons*A horizon:*

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1

Texture—silt loam and silty clay loam

Bw horizon:

Hue—10YR or 2.5Y

Value—3 to 5 (2 to 4 moist)

Chroma—1 to 4

Texture—silty clay loam or silt loam

2C horizon:

Hue—2.5Y or 5Y

Value—5 to 7 (4 or 5 moist)

Chroma—2 to 4

Texture—clay loam or loam

Buse Series*Depth to bedrock:* Very deep*Drainage class:* Well drained*Permeability:* Moderately slow*Landform:* Till plains and moraines*Parent material:* Loamy glacial till*Slope:* 3 to 40 percent**Typical Pedon**

Buse loam, in an area of Forman-Buse-Aastad loams, 1 to 6 percent slopes, 275 feet south and 1,890 feet west of the northeast corner of sec. 27, T. 123 N., R. 58 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak medium granular; slightly hard, friable, sticky and plastic; common fine roots; about 8 percent pebbles; strong effervescence; slightly alkaline; clear smooth boundary.

Bk—7 to 22 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak coarse subangular blocky structure parting to weak fine subangular blocky; hard, friable, sticky and plastic; few fine roots; common medium accumulations of carbonate; about 10 percent

pebbles; violent effervescence; moderately alkaline; gradual wavy boundary.

- C—22 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, sticky and plastic; about 10 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 10 inches

Depth to carbonates: 0 to 10 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR

Value—3 to 5 (2 or 3 moist)

Chroma—1 or 2

Texture—loam or clay loam

Bk horizon:

Hue—10YR or 2.5Y

Value—4 to 8 (4 to 6 moist)

Chroma—2 to 4

Texture—loam or clay loam

C horizon:

Hue—10YR, 2.5Y, or 5Y

Value—4 to 7 (4 to 6 moist)

Chroma—2 to 6

Texture—loam or clay loam

Cavour Series

Depth to bedrock: Very deep

Drainage class: Moderately well drained

Permeability: Very slow

Landform: Till plains

Parent material: Loamy glacial till

Slope: 0 to 2 percent

Typical Pedon

Cavour loam, in an area of Cresbard-Cavour loams, 1,726 feet west and 192 feet north of the southeast corner of sec. 7, T. 121 N., R. 59 W.

- Ap—0 to 6 inches; dark gray (10YR 4/1) loam, black (10YR2/1) moist; weak medium subangular blocky structure parting to weak medium and fine granular; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; abrupt smooth boundary.

- E—6 to 7 inches; dark gray (10YR 4/1) and gray (10YR 5/1) loam, very dark gray and black (10YR 3/1 and 2/1) moist; weak medium and thin platy structure; slightly hard, very friable; common fine and very

fine roots; neutral; abrupt smooth boundary.

- Btn1—7 to 14 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; strong medium columnar structure parting to strong medium angular blocky; very hard, firm, sticky and plastic; common fine and very fine roots; thin continuous gray (10YR 5/1) coatings on the tops of columns; continuous shiny films on vertical faces of peds; about 3 percent pebbles; slightly alkaline; clear wavy boundary.

- Btn2—14 to 19 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; strong medium prismatic structure parting to moderate medium and fine angular blocky; very hard, firm, sticky and plastic; common very fine roots; continuous shiny films on vertical faces of peds; about 3 percent pebbles; moderately alkaline; clear wavy boundary.

- Bkz—19 to 31 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; very hard, firm, sticky and plastic; common very fine roots; patchy shiny films on vertical faces of peds; common fine and medium nests of gypsum and other salts; about 5 percent pebbles; strong effervescence; strongly alkaline; clear wavy boundary.

- C1—31 to 47 inches; light brownish gray (2.5Y 6/2) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, firm, sticky and plastic; few or common fine nests of gypsum and other salts; about 5 percent pebbles; slight effervescence; moderately alkaline; gradual wavy boundary.

- C2—47 to 60 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; common fine prominent yellowish brown (10YR 5/6) and gray (10YR 6/1) mottles; massive; hard, friable, slightly sticky and plastic; few fine dark stains of manganese oxide; few fine prominent red (2.5YR 4/6) iron stains; common fine shale chips; few fine accumulations of carbonate; few fine nests of gypsum and other salts; about 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 35 inches

Depth to carbonates: 14 to 35 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 16 to 45 inches

Thickness of the surface soil: 6 to 12 inches

A horizon:

Hue—10YR or neutral

Value—3 to 5 (2 or 3 moist)

Chroma—0 or 1

Texture—loam, silt loam, or clay loam

E horizon (if it occurs):

Hue—10YR

Value—3 to 7 (2 to 5 moist)

Chroma—1 or 2

Texture—mainly silt loam or loam; fine sandy loam in some pedons

Btn horizon:

Hue—10YR, 2.5Y, or 5Y

Value—3 to 5 (2 to 4 moist)

Chroma—1 to 3

Texture—clay loam, clay, silty clay, or silty clay loam

Bk horizon:

Hue—10YR, 2.5Y, or 5Y

Value—5 or 6 (4 or 5 moist)

Chroma—1 to 3

Texture—loam, clay loam, silty clay loam, silty clay, or clay

C horizon:

Hue—2.5Y or 5Y

Value—5 to 7 (4 or 5 moist)

Chroma—1 to 4

Texture—loam or clay loam

grayish brown (2.5Y 5/2) moist; few fine prominent yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine accumulations of carbonate; violent effervescence; moderately alkaline; clear wavy boundary.

Bk3—27 to 36 inches; pale yellow (2.5Y 8/2) silt loam, light brownish gray (2.5Y 6/2) moist; few fine prominent yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine nests of salts; violent effervescence; moderately alkaline; clear wavy boundary.

Cg1—36 to 49 inches; light gray (2.5Y 7/2) silty clay loam, light brownish gray (2.5Y 6/2) moist; many medium prominent brownish yellow (10YR 6/6) mottles; massive; hard, firm, sticky and plastic; strong effervescence; slightly alkaline; clear wavy boundary.

Cg2—49 to 60 inches; light gray (2.5Y 7/2) silty clay loam, light brownish gray (2.5Y 6/2) moist; common medium prominent yellowish brown (10YR 5/6) mottles; massive; hard, firm, sticky and plastic; strong effervescence; moderately alkaline.

Colvin Series

Depth to bedrock: Very deep

Drainage class: Poorly drained

Permeability: Moderately slow

Landform: Lake plains and outwash channels

Parent material: Silty sediments

Slope: 0 to 1 percent

Typical Pedon

Colvin silty clay loam, 380 feet north and 1,040 feet west of the southeast corner of sec. 26, T. 121 N., R. 55 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and plastic; many fine roots; strong effervescence; moderately alkaline; abrupt smooth boundary.

Bk1—7 to 18 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; moderate coarse subangular blocky structure parting to moderate fine subangular blocky; slightly hard, friable, slightly sticky and plastic; common fine roots; violent effervescence; moderately alkaline; clear wavy boundary.

Bk2—18 to 27 inches; light gray (2.5Y 7/2) silt loam,

Range in Characteristics

Thickness of the mollic epipedon: 7 to 24 inches

Depth to carbonates: 0 to 6 inches

Depth to contrasting or impervious layer: 40 to more than 60 inches over clayey or sandy material

Depth to gypsum and other salts: 30 to more than 60 inches

Other features: A Bky or Bkz horizon in some pedons

A horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 or 4 (2 or 3 moist)

Chroma—0 or 1

Texture—silty clay loam or silt loam

Bk horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—5 to 8 (3 to 7 moist)

Chroma—0 to 3

Texture—mainly silt loam or silty clay loam; clay loam in some pedons

Cg horizon:

Hue—2.5Y or 5Y

Value—5 to 7 (3 to 6 moist)

Chroma—1 to 4

Texture—mainly silt loam or silty clay loam; clay loam in some pedons

Cresbard Series

Depth to bedrock: Very deep

Drainage class: Moderately well drained

Permeability: Slow

Landform: Till plains

Parent material: Loamy glacial till

Slope: 0 to 2 percent

Typical Pedon

Cresbard loam, in an area of Cresbard-Cavour loams, 1,100 feet west and 210 feet south of the northeast corner of sec. 18, T. 121 N., R. 59 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; moderate fine granular structure; slightly hard, friable, slightly plastic; many fine and very fine roots; slightly acid; abrupt smooth boundary.

A—6 to 9 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium and fine subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky; common fine and very fine roots; slightly acid; clear wavy boundary.

BE—9 to 12 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; gray (10YR 5/1) silt coatings on faces of peds; moderate medium and fine angular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; about 2 percent pebbles; slightly acid; clear wavy boundary.

Btn—12 to 20 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to moderate coarse and medium angular blocky; very hard, firm, sticky and plastic; few very fine roots; patchy shiny films on vertical faces of peds; about 3 percent pebbles; neutral; clear wavy boundary.

Btnz—20 to 30 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate coarse and medium subangular blocky; very hard, firm, sticky and plastic; few very fine roots; shiny films on vertical faces of peds; common fine accumulations of carbonate in the lower part; few fine nests of salts; about 3 percent pebbles; slight effervescence; neutral; clear wavy boundary.

Bk—30 to 42 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak coarse and medium subangular blocky structure; hard, firm, sticky and plastic; common fine accumulations of carbonate; few fine nests of salts; about 3 percent

pebbles; violent effervescence; moderately alkaline; gradual wavy boundary.

C1—42 to 52 inches; light gray (2.5Y 7/2) clay loam, light yellowish brown (2.5Y 6/4) moist; few fine prominent yellowish brown (10YR 5/8) mottles; massive; hard, firm, sticky and plastic; few fine nests of gypsum and other salts; about 5 percent pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—52 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, light olive brown (2.5Y 5/4) moist; common fine prominent yellowish brown (10YR 5/6) and common fine prominent gray (10YR 6/1) mottles; massive; hard, firm, sticky and plastic; few fine accumulations of carbonate; few fine nests of gypsum and other salts; about 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 36 inches

Depth to carbonates: 15 to 40 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 16 to more than 60 inches

Thickness of the surface soil: 7 to 17 inches

Other features: An E horizon in some pedons

A horizon:

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1 or 2

Texture—loam or silt loam

BE horizon:

Hue—10YR or 2.5Y

Value—3 to 6 (2 to 4 moist)

Chroma—1 to 3

Texture—silty clay loam or clay loam

Btn horizon:

Hue—10YR or 2.5Y

Value—3 to 6 (2 to 4 moist)

Chroma—1 to 3

Texture—silty clay, clay loam, or clay

Bk horizon:

Hue—2.5Y or 5Y

Value—5 to 7 (4 to 6 moist)

Chroma—2 to 4

Texture—clay loam, loam, or silt loam

C horizon:

Hue—2.5Y or 5Y

Value—5 to 7 (4 to 6 moist)

Chroma—2 to 4

Texture—clay loam, loam, or silt loam

Cubden Series*Depth to bedrock:* Very deep*Drainage class:* Somewhat poorly drained*Permeability:* Moderate*Landform:* Till plains*Parent material:* Silty glacial till*Slope:* 0 to 2 percent**Typical Pedon**

Cubden silty clay loam, in an area of Cubden-Tonka complex, 2,380 feet south and 530 feet west of the northeast corner of sec. 31, T. 120 N., R. 55 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; common fine and many very fine roots; strong effervescence; slightly alkaline; abrupt smooth boundary.

Bk—10 to 22 inches; gray (10YR 6/1) silty clay loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few fine accumulations of carbonate; violent effervescence; moderately alkaline; clear wavy boundary.

C1—22 to 36 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few fine prominent strong brown (7.5YR 4/6) iron stains; strong effervescence; moderately alkaline; clear wavy boundary.

C2—36 to 43 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; few fine prominent gray (5Y 5/1) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; strong effervescence; moderately alkaline; clear wavy boundary.

C3—43 to 60 inches; light gray (5Y 7/1) silt loam, gray (5Y 5/1) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common medium prominent strong brown (7.5YR 4/6) and yellowish brown (10YR 5/4) iron stains; strong effervescence; moderately alkaline.

Range in Characteristics*Thickness of the mollic epipedon:* 7 to 20 inches*Depth to carbonates:* 0 to 7 inches*Depth to contrasting or impervious layer:* 40 to more than 60 inches over loamy glacial till*Depth to gypsum and other salts:* 40 to more than 60 inches*Other features:* An ABk or 2C horizon in some pedons*A horizon:*

Hue—10YR or 2.5Y

Value—3 to 5 (2 or 3 moist)

Chroma—1 or 2

Texture—silty clay loam or silt loam

Bk horizon:

Hue—10YR, 2.5Y, or 5Y

Value—5 to 7 (3 to 5 moist)

Chroma—1 to 4

Texture—silty clay loam or silt loam

C horizon:

Hue—2.5Y or 5Y

Value—5 to 7 (4 to 6 moist)

Chroma—2 to 4

Texture—silty clay loam or silt loam

Divide Series*Depth to bedrock:* Very deep*Drainage class:* Somewhat poorly drained*Permeability:* Moderate in the loamy sediments and rapid in the underlying gravelly material*Landform:* Outwash plains*Parent material:* Loamy alluvium over glacial outwash*Slope:* 0 to 3 percent**Typical Pedon**

Divide loam, in an area of Marysland-Divide loams, 2,470 feet south and 2,150 feet east of the northwest corner of sec. 2, T. 121 N., R. 53 W.

A—0 to 9 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; slight effervescence; moderately alkaline; clear smooth boundary.

Bk1—9 to 18 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure parting to moderate medium granular; hard, friable, slightly sticky and slightly plastic; common very fine roots; violent effervescence; moderately alkaline; clear smooth boundary.

Bk2—18 to 25 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; few fine prominent dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure parting to moderate medium granular; hard, friable, slightly sticky and slightly plastic; common very fine roots; violent effervescence; moderately alkaline; abrupt wavy boundary.

2C1—25 to 36 inches; light yellowish brown (2.5Y 6/4)

gravelly sand, light olive brown (2.5Y 5/4) moist; single grain; loose; about 30 percent gravel; strong effervescence; moderately alkaline; gradual wavy boundary.

2C2—36 to 60 inches; light yellowish brown (2.5Y 6/4) gravelly sand, olive brown (2.5Y 4/4) moist; single grain; loose; about 30 percent gravel; slight effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches

Depth to carbonates: 0 to 10 inches

Depth to contrasting or impervious layer: 20 to 40 inches over gravelly material

Depth to gypsum and other salts: More than 60 inches

Other features: An ABk horizon in some pedons

A horizon:

Hue—10YR or 2.5Y

Value—3 to 5 (2 or 3 moist)

Chroma—1 or 2

Texture—loam, sandy loam, sandy clay loam, or clay loam

Bk horizon:

Hue—10YR, 2.5Y, or 5Y

Value—5 to 8 (3 to 7 moist)

Chroma—1 to 4

Texture—loam, clay loam, or sandy clay loam

2C horizon:

Hue—10YR, 2.5Y, or 5Y

Value—5 to 7 (4 to 6 moist)

Chroma—2 to 6

Texture—stratified sand to gravelly sand

Dovray Series

Depth to bedrock: Very deep

Drainage class: Very poorly drained

Permeability: Slow

Landform: Lake plains

Parent material: Clayey glaciolacustrine sediments

Slope: 0 to 2 percent

Typical Pedon

Dovray silty clay, 2,255 feet north and 30 feet east of the southwest corner of sec. 9, T. 124 N., R. 59 W.

A1—0 to 8 inches; dark gray (N 4/0) silty clay, black (N 2/0) moist; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; many coarse and medium roots; neutral; clear wavy boundary.

A2—8 to 20 inches; dark gray (N 4/0) silty clay, black (N 2/0) moist; moderate very fine angular blocky structure; very hard, firm, sticky and plastic;

common fine and very fine roots; slightly alkaline; clear wavy boundary.

Bg—20 to 46 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; moderate medium and fine angular blocky structure parting to moderate very fine angular blocky; very hard, firm, sticky and plastic; slightly alkaline; gradual wavy boundary.

Cg1—46 to 56 inches; light gray (5Y 7/1) silty clay loam, light olive gray (5Y 6/2) moist; weak coarse and medium subangular blocky structure; hard, friable, sticky and slightly plastic; strong effervescence; slightly alkaline; gradual wavy boundary.

Cg2—56 to 60 inches; light gray (5Y 7/2) loam, light olive gray (5Y 6/2) moist; many medium and fine prominent brownish yellow (10YR 6/6) mottles; massive; hard, friable, slightly sticky and slightly plastic; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 54 inches

Depth to carbonates: 20 to 60 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 10 to more than 60 inches

A horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 or 4 (2 or 3 moist)

Chroma—0 or 1

Texture—silty clay or clay

Bg horizon:

Hue—2.5Y or 5Y

Value—4 to 7 (3 to 6 moist)

Chroma—1 or 2

Texture—mainly silty clay or clay; clay loam or silty clay loam in some pedons

Cg horizon:

Hue—2.5Y or 5Y

Value—5 to 7 (4 to 6 moist)

Chroma—1 or 2

Texture—mainly silty clay or clay; loam, silt loam, clay loam, or silty clay loam in some pedons

Eckman Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Lake plains

Parent material: Silty and loamy glaciolacustrine sediments

Slope: 0 to 6 percent

Typical Pedon

Eckman very fine sandy loam, in an area of Eckman-Gardena very fine sandy loams, 2 to 6 percent slopes, 340 feet north and 185 feet east of the southwest corner of sec. 19, T. 124 N., R. 59 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) very fine sandy loam, black (10YR 2/1) moist; weak very fine granular structure; soft, very friable; common very fine and few fine roots; neutral; abrupt smooth boundary.

Bw—7 to 12 inches; grayish brown (2.5Y 5/2) very fine sandy loam, very dark grayish brown (2.5Y 3/2) moist; weak coarse prismatic structure parting to weak coarse and medium subangular blocky; soft, very friable; common very fine and few fine roots; neutral; clear wavy boundary.

Bk—12 to 31 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure parting to weak coarse and medium subangular blocky; slightly hard, friable; few fine roots; violent effervescence; slightly alkaline; clear wavy boundary.

C1—31 to 47 inches; light gray (2.5Y 7/2) silt loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable; strong effervescence; moderately alkaline; clear wavy boundary.

C2—47 to 60 inches; pale yellow (2.5Y 7/4) very fine sandy loam, light yellowish brown (2.5Y 6/4) moist; common fine distinct olive yellow (2.5Y 6/6) mottles; massive, varved; slightly hard, very friable; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches

Depth to carbonates: 10 to 36 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR

Value—3 to 5 (2 or 3 moist)

Chroma—1 or 2

Texture—very fine sandy loam, silt loam, or loam

Bw horizon:

Hue—10YR or 2.5Y

Value—4 to 6 (3 to 5 moist)

Chroma—2 to 4

Texture—silt loam, loam, or very fine sandy loam

Bk horizon:

Hue—10YR or 2.5Y

Value—6 to 8 (5 or 6 moist)

Chroma—2 to 4

Texture—silt loam, very fine sandy loam, or loam

C horizon:

Hue—10YR or 2.5Y

Value—6 to 8 (5 or 6 moist)

Chroma—2 to 4

Texture—mainly silt loam, very fine sandy loam, or loam; very fine sand or fine sandy loam in some pedons

Other features—varves in the lower part in some pedons

Edgeley Series

Depth to bedrock: Moderately deep

Drainage class: Well drained

Permeability: Moderate in the loamy sediments and very slow in the underlying shale

Landform: Till plains and moraines

Parent material: Loamy glacial till over shale bedrock

Slope: 4 to 9 percent

Typical Pedon

Edgeley loam, 4 to 9 percent slopes, 651 feet west and 1,248 feet north of the southeast corner of sec. 25, T. 124 N., R. 59 W.

A—0 to 5 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak medium and fine granular; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; about 3 percent pebbles; slightly acid; clear wavy boundary.

Bw1—5 to 12 inches; dark gray (10YR 4/1) clay loam, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; about 3 percent pebbles; neutral; clear wavy boundary.

Bw2—12 to 19 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; about 3 percent pebbles; neutral; clear wavy boundary.

Bk1—19 to 26 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common fine and few medium accumulations of carbonate; about 5 percent pebbles; strong effervescence; slightly alkaline; gradual wavy boundary.

Bk2—26 to 30 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist;

weak coarse and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common fine accumulations of carbonate; about 5 percent pebbles; about 15 percent shale fragments; strong effervescence; slightly alkaline; clear wavy boundary.

2Cr—30 to 60 inches; gray (5Y 6/1) bedded shale, dark gray (5Y 4/1) moist; accumulations of carbonate along fractures; slight effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches

Depth to carbonates: 16 to 24 inches

Depth to contrasting or impervious layer: 20 to 40 inches over shale

Depth to gypsum and other salts: More than 60 inches

Other features: A C horizon above the 2Cr horizon in some pedons

A horizon:

Hue—10YR or 2.5Y

Value—3 or 4 (2 or 3 moist)

Chroma—1

Texture—loam, clay loam, silt loam, or silty clay loam

Bw horizon:

Hue—10YR or 2.5Y

Value—4 to 6 (2 to 4 moist)

Chroma—1 to 3

Texture—loam, silt loam, silty clay loam, or clay loam

2Cr horizon:

Hue—2.5Y or 5Y

Value—5 to 7 (3 to 5 moist)

Chroma—1 to 3

Type of bedrock—soft shale

Egeland Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Outwash plains

Parent material: Loamy glaciofluvial sediments

Slope: 0 to 12 percent

Typical Pedon

Egeland sandy loam, in an area of Maddock-Egeland sandy loams, 2 to 6 percent slopes, 2,160 feet north and 2,160 feet east of the southwest corner of sec. 1, T. 124 N., R. 53 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) sandy loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to moderate medium granular; soft, very friable; common fine roots; slightly acid; abrupt smooth boundary.

Bw1—8 to 14 inches; brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; soft, very friable; few fine roots; neutral; clear smooth boundary.

Bw2—14 to 30 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; soft, very friable; neutral; clear smooth boundary.

Bw3—30 to 36 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; weak coarse prismatic structure; soft, very friable; neutral; clear smooth boundary.

Bk—36 to 46 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; weak coarse subangular blocky structure; soft, very friable; few fine accumulations of carbonate; strong effervescence; slightly alkaline; clear smooth boundary.

C—46 to 60 inches; very pale brown (10YR 7/3) loamy sand, brown (10YR 5/3) moist; single grain; loose; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 16 inches

Depth to carbonates: 14 to 45 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1

Texture—sandy loam, fine sandy loam, or loam

Bw horizon:

Hue—10YR or 2.5Y

Value—4 to 6 (2 to 5 moist)

Chroma—1 to 4

Texture—mainly sandy loam or fine sandy loam; loamy sand or loamy fine sand in some pedons

Bk horizon:

Hue—10YR or 2.5Y

Value—5 to 7 (4 or 5 moist)

Chroma—2 to 4

Texture—mainly loamy sand or loamy fine sand; sandy loam, fine sandy loam, or loamy very fine sand in some pedons

C horizon:

Hue—10YR or 2.5Y

Value—5 to 7 (4 or 5 moist)

Chroma—2 to 4

Texture—mainly loamy sand or loamy fine sand;
sandy loam, loamy very fine sand, very fine
sandy loam, or fine sandy loam in some pedons**Embden Series***Depth to bedrock:* Very deep*Drainage class:* Moderately well drained*Permeability:* Moderately rapid*Landform:* Outwash plains*Parent material:* Loamy glaciofluvial sediments*Slope:* 2 to 6 percent**Typical Pedon**Embden fine sandy loam, in an area of Egeland-
Embden complex, 2 to 6 percent slopes, 1,030 feet
north and 240 feet east of the southwest corner of sec.
10, T. 120 N., R. 58 W.Ap—0 to 9 inches; dark gray (10YR 4/1) fine sandy
loam, black (10YR 2/1) moist; weak medium and
fine granular structure; slightly hard, very friable;
common fine and many very fine roots; neutral;
abrupt smooth boundary.Bw1—9 to 24 inches; dark gray (10YR 4/1) loam, black
(10YR 2/1) moist; weak coarse prismatic structure
parting to weak medium and fine subangular blocky
and medium and fine granular; slightly hard, very
friable; few fine and many very fine roots; neutral;
gradual wavy boundary.Bw2—24 to 34 inches; grayish brown (10YR 5/2) sandy
loam, dark grayish brown (10YR 4/2) moist; weak
medium subangular blocky structure parting to
medium and fine granular; slightly hard, very friable;
common very fine roots; neutral; gradual wavy
boundary.Bk1—34 to 42 inches; grayish brown (10YR 5/2) sandy
loam, dark grayish brown (10YR 4/2) moist; weak
medium subangular blocky structure parting to weak
medium and fine granular; slightly hard, very friable;
few very fine roots; strong effervescence; slightly
alkaline; clear wavy boundary.Bk2—42 to 51 inches; light brownish gray (2.5Y 6/2)
very fine sandy loam, grayish brown (2.5Y 5/2)
moist; common fine prominent yellowish brown
(10YR 5/6) mottles; weak medium and fine
subangular blocky structure parting to weak medium
and fine granular; slightly hard, very friable;
common fine dark stains of manganese oxide;
strong effervescence; slightly alkaline; gradual wavy
boundary.C—51 to 60 inches; light brownish gray (2.5Y 6/2) very
fine sandy loam, grayish brown (2.5Y 5/2) moist;
common fine prominent yellowish brown (10YR 5/6)
and few fine distinct dark yellowish brown (10YR
4/6) mottles; massive; slightly hard, very friable;
common fine dark stains of manganese oxide;
strong effervescence; moderately alkaline.**Range in Characteristics***Thickness of the mollic epipedon:* 16 to 40 inches*Depth to carbonates:* 20 to 60 inches*Depth to contrasting or impervious layer:* More than 60
inches*Depth to gypsum and other salts:* More than 60 inches*A horizon:*

Hue—10YR or 2.5Y

Value—3 or 4 (2 or 3 moist)

Chroma—1

Texture—fine sandy loam, sandy loam, very fine
sandy loam, or loam*Bw horizon:*

Hue—10YR or 2.5Y

Value—3 to 5 (2 to 4 moist)

Chroma—1 to 4

Texture—fine sandy loam, loam, sandy loam, or
very fine sandy loam*Bk horizon:*

Hue—10YR, 2.5Y, or 5Y

Value—4 to 8 (3 to 6 moist)

Chroma—1 to 4

Texture—fine sandy loam, sandy loam, loamy fine
sand, very fine sandy loam, or loamy sand*C horizon:*

Hue—10YR, 2.5Y, or 5Y

Value—5 to 7 (4 to 6 moist)

Chroma—1 to 4

Texture—fine sandy loam, sandy loam, loamy fine
sand, or very fine sandy loam**Exline Series***Depth to bedrock:* Very deep*Drainage class:* Somewhat poorly drained and
moderately well drained*Permeability:* Very slow*Landform:* Lake plains*Parent material:* Silty and clayey glaciolacustrine
sediments*Slope:* 0 to 3 percent**Typical Pedon**Exline silt loam, in an area of Exline-Aberdeen-Nahon
silt loams, 90 feet north and 1,950 feet east of the

southwest corner of sec. 30, T. 124 N., R. 59 W.

E—0 to 2 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak very thin platy structure; soft, very friable; many fine and very fine roots; slightly acid; abrupt smooth boundary.

Btn—2 to 7 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; strong medium columnar structure parting to strong fine angular blocky; very hard, very firm, very sticky and very plastic; common fine roots; thin continuous gray (10YR 6/1) coatings on the tops of columns; continuous shiny films on vertical faces of peds; neutral; clear wavy boundary.

Btnz1—7 to 18 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to strong fine and medium angular blocky; very hard, very firm, very sticky and very plastic; common fine roots; thin continuous shiny films on vertical faces of peds; common medium and fine accumulations of salts; neutral; clear wavy boundary.

Btnz2—18 to 26 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; weak very coarse prismatic structure parting to weak medium and fine subangular blocky; very hard, very firm, very sticky and very plastic; thin patchy shiny films on vertical faces of peds; common medium and fine accumulations of salts; slight effervescence; slightly alkaline; clear wavy boundary.

Bk—26 to 37 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak coarse and medium subangular blocky structure; hard, firm, sticky and plastic; few fine and medium nests of salts; strong effervescence; moderately alkaline; clear wavy boundary.

C1—37 to 47 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, sticky and slightly plastic; varves 1 to 2 millimeters thick; common fine prominent yellowish brown (10YR 5/6) iron stains; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—47 to 60 inches; white (2.5Y 8/2) silty clay loam, light yellowish brown (2.5Y 6/4) moist; massive; hard, friable, sticky and slightly plastic; varves 1 to 2 millimeters thick; common medium and fine prominent yellowish brown (10YR 5/6) iron stains; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 28 inches

Depth to carbonates: 8 to 28 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 6 to 16 inches

Other features: Some pedons have an A horizon 1 to 3 inches thick.

A horizon (if it occurs):

Hue—10YR

Value—3 to 5 (2 or 3 moist)

Chroma—1

Texture—silt loam, silty clay loam, silty clay, or loam

E horizon:

Hue—10YR

Value—5 or 6 (3 to 5 moist)

Chroma—1

Texture—silt loam, loam, or silty clay loam

Btn horizon:

Hue—10YR or 2.5Y

Value—3 to 5 (2 to 4 moist)

Chroma—1 or 2

Texture—mainly silty clay, clay, or silty clay loam; clay loam in some pedons

Bk horizon:

Hue—10YR or 2.5Y

Value—4 to 6 (3 to 5 moist)

Chroma—1 to 3

Texture—mainly silty clay, clay, or silty clay loam; clay loam in some pedons

C horizon:

Hue—2.5Y or 5Y

Value—5 to 8 (3 to 7 moist)

Chroma—2 to 4

Texture—mainly silt loam or silty clay loam; varved very fine sand to clay in some pedons

Ferney Series

Depth to bedrock: Very deep

Drainage class: Moderately well drained

Permeability: Very slow

Landform: Till plains

Parent material: Loamy glacial till

Slope: 0 to 2 percent

Typical Pedon

Ferney loam, in an area of Cavour-Ferney loams, 2,120 feet west and 210 feet north of the southeast corner of sec. 7, T. 121 N., R. 59 W.

Ap—0 to 4 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable; many fine and very fine roots; about 3 percent pebbles; neutral; abrupt smooth boundary.

Btn—4 to 9 inches; dark gray (10YR 4/1) clay loam, black (10YR 2/1) moist; strong medium columnar structure parting to strong medium and fine angular blocky; very hard, firm, sticky and plastic; many very fine roots; thin continuous gray (10YR 6/1) coatings on the tops of columns; shiny films on faces of peds; about 3 percent pebbles; slightly alkaline; clear wavy boundary.

Btnkz—9 to 15 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate coarse and medium prismatic structure parting to strong medium and fine angular blocky; very hard, firm, sticky and plastic; common very fine roots; shiny films on faces of peds; many fine nests of salts; about 3 percent pebbles; strong effervescence; moderately alkaline; clear wavy boundary.

Bkz1—15 to 27 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse and medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; few fine crystals of gypsum; common fine nests of salts; about 3 percent pebbles; strong effervescence; strongly alkaline; clear wavy boundary.

Bkz2—27 to 38 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse and medium subangular blocky structure; hard, firm, sticky and plastic; common fine nests and crystals of gypsum; many fine nests and crystals of salts; about 3 percent pebbles; strong effervescence; strongly alkaline; clear wavy boundary.

C1—38 to 47 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine and medium nests and crystals of gypsum; few fine nests of salts; about 3 percent pebbles; strong effervescence; strongly alkaline; gradual wavy boundary.

C2—47 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; common fine prominent yellowish brown (10YR 5/6) iron stains; few fine nests of gypsum and other salts; about 3 percent pebbles; strong effervescence; strongly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches

Depth to carbonates: 5 to 16 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 5 to 16 inches

Other features: An E horizon in some pedons

A horizon:

Hue—10YR

Value—4 or 5 (2 or 3 moist)

Chroma—1

Texture—loam, clay loam, or silt loam

Btn horizon:

Hue—10YR or 2.5Y

Value—3 to 5 (2 or 3 moist)

Chroma—1 to 4

Texture—clay loam or clay

Bk horizon:

Hue—10YR or 2.5Y

Value—5 to 8 (3 to 6 moist)

Chroma—2 to 4

Texture—clay loam or clay

C horizon:

Hue—10YR, 2.5Y, or 5Y

Value—5 to 8 (3 to 6 moist)

Chroma—2 to 4

Texture—clay loam or clay

Fordville Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Moderate in the loamy sediments and rapid in the underlying gravelly material

Landform: Outwash plains

Parent material: Loamy alluvium over glacial outwash

Slope: 0 to 6 percent

Typical Pedon

Fordville loam, in an area of Renshaw-Fordville loams, 0 to 2 percent slopes, 75 feet north and 1,415 feet east of the southwest corner of sec. 1, T. 122 N., R. 53 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to moderate medium granular; slightly hard, friable; common fine roots; slightly acid; abrupt smooth boundary.

Bw1—9 to 20 inches; very dark grayish brown (10YR 3/2) loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable; few fine roots; slightly alkaline; clear wavy boundary.

Bw2—20 to 29 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure parting to weak medium subangular blocky; slightly hard, friable; slightly sticky and slightly plastic; few fine roots; slightly alkaline; clear smooth boundary.

2C1—29 to 33 inches; light brownish gray (10YR 6/2) gravelly loamy sand, brown (10YR 5/3) moist; single grain; carbonate coatings on underside of pebbles; loose; about 25 percent gravel; slight effervescence; moderately alkaline; clear wavy boundary.

2C2—33 to 60 inches; pale brown (10YR 6/3) gravelly sand, brown (10YR 5/3) moist; single grain; loose; about 30 percent gravel; slight effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 30 inches

Depth to carbonates: 17 to 40 inches

Depth to contrasting or impervious layer: 20 to 40 inches over gravelly material

Depth to gypsum and other salts: More than 60 inches

Other features: A Bk horizon in some pedons

A horizon:

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1 or 2

Texture—loam or silt loam

Bw horizon:

Hue—10YR

Value—3 to 5 (2 to 4 moist)

Chroma—1 to 4

Texture—loam, silt loam, or clay loam

2C horizon:

Hue—10YR or 2.5Y

Value—4 to 7 (3 to 6 moist)

Chroma—2 to 4

Texture—mainly sand, gravelly loamy sand, or gravelly sand; loamy sand, gravelly coarse sand, very gravelly sand, or very gravelly loamy sand in some pedons

Forman Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Till plains and moraines

Parent material: Loamy glacial till

Slope: 0 to 9 percent

Typical Pedon

Forman loam, in an area of Forman-Buse-Aastad loams, 1 to 6 percent slopes, 250 feet south and 1,730 feet west of the northeast corner of sec. 27, T. 123 N., R. 58 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak coarse subangular blocky structure parting to moderate medium

granular; slightly hard, friable, slightly sticky and plastic; common fine roots; about 3 percent pebbles; neutral; abrupt smooth boundary.

Bt—8 to 15 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; few fine roots; many shiny films on faces of ped; about 3 percent pebbles; slightly alkaline; clear smooth boundary.

Bk—15 to 28 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; few medium accumulations of carbonate; about 5 percent pebbles; strong effervescence; moderately alkaline; clear smooth boundary.

C—28 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, firm, sticky and plastic; about 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 9 to 16 inches

Depth to carbonates: 10 to 24 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 40 to more than 60 inches

A horizon:

Hue—10YR

Value—3 or 4 (2 moist)

Chroma—1

Texture—loam, clay loam, or silt loam

Bt horizon:

Hue—10YR or 2.5Y

Value—4 or 5 (3 or 4 moist)

Chroma—1 to 3

Texture—clay loam

Bk horizon:

Hue—2.5Y

Value—5 to 7 (4 to 6 moist)

Chroma—2 to 4

Texture—clay loam

C horizon:

Hue—2.5Y or 5Y

Value—5 to 7 (4 to 6 moist)

Chroma—2 to 4

Texture—clay loam or loam

Gardena Series

Depth to bedrock: Very deep

Drainage class: Moderately well drained

Permeability: Moderate

Landform: Lake plains

Parent material: Silty and loamy glaciolacustrine sediments

Slope: 2 to 3 percent

Typical Pedon

Gardena very fine sandy loam, in an area of Eckman-Gardena very fine sandy loams, 2 to 6 percent slopes, 2,000 feet north and 90 feet west of the southeast corner of sec. 7, T. 125 N., R. 60 W., in Brown County:

Ap—0 to 8 inches; dark gray (10YR 4/1) very fine sandy loam, black (10YR 2/1) moist; weak coarse and medium subangular blocky structure parting to weak medium and fine granular; soft, very friable; common fine roots; neutral; abrupt smooth boundary.

A—8 to 20 inches; dark gray (10YR 4/1) very fine sandy loam, black (10YR 2/1) moist; weak coarse and medium subangular blocky structure parting to weak very fine granular; soft, friable; common fine roots; slightly alkaline; clear wavy boundary.

Bw—20 to 34 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable; few fine roots; slightly alkaline; gradual wavy boundary.

Bk—34 to 44 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; slightly hard, friable; violent effervescence; moderately alkaline; gradual wavy boundary.

C—44 to 60 inches; light gray (2.5Y 7/2) silt loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable; few fine accumulations of carbonate; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 40 inches

Depth to carbonates: 14 to 40 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1 or 2

Texture—very fine sandy loam, silt loam, or loam

Bw horizon:

Hue—10YR or 2.5Y

Value—3 to 5 (2 to 4 moist)

Chroma—1 to 3

Texture—mainly silt loam or very fine sandy loam; loam in some pedons

Bk horizon:

Hue—10YR, 2.5Y, or 5Y

Value—5 to 7 (4 to 6 moist)

Chroma—2 to 4

Texture—mainly silt loam or very fine sandy loam; loam in some pedons

C horizon:

Hue—10YR, 2.5Y, or 5Y

Value—5 to 7 (4 to 6 moist)

Chroma—2 to 4

Texture—mainly silt loam or very fine sandy loam; loam in some pedons

Other features—varved in the lower part in some pedons with very fine sand, silt, or silty clay

Great Bend Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Moderate in the upper part, moderate to slow in the lower part

Landform: Lake plains

Parent material: Silty glaciolacustrine sediments

Slope: 0 to 9 percent

Typical Pedon

Great Bend silt loam, 0 to 2 percent slopes, 2,470 feet north and 90 feet east of the southwest corner of sec. 5, T. 124 N., R. 59 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, friable; common fine and very fine roots; neutral; abrupt smooth boundary.

Bw1—7 to 12 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to weak coarse and medium subangular blocky; slightly hard, friable; few very fine roots; neutral; clear wavy boundary.

Bw2—12 to 17 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak coarse and medium subangular blocky; slightly hard, friable; slightly alkaline; clear wavy boundary.

Bk1—17 to 23 inches; pale yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parting to weak coarse and medium subangular blocky; slightly hard, very friable; few very fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

Bk2—23 to 30 inches; pale yellow (2.5Y 7/4) silt loam,

light olive brown (2.5Y 5/4) moist; weak coarse and medium subangular blocky structure; slightly hard, very friable; few very fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

C1—30 to 39 inches; light gray (2.5Y 7/2) silt loam, light yellowish brown (2.5Y 6/4) moist; massive; slightly hard, friable; varves 1 to 2 millimeters thick; strong effervescence; strongly alkaline; clear wavy boundary.

C2—39 to 52 inches; light gray (2.5Y 7/2) silt loam varved with silty clay and very fine sandy loam, light yellowish brown (2.5Y 6/4) moist; massive; slightly hard, friable; varves 1 to 3 millimeters thick; common fine distinct light olive brown (2.5Y 5/6) iron stains; strong effervescence; strongly alkaline; clear wavy boundary.

C3—52 to 60 inches; light brownish gray (2.5Y 6/2) very fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable; common fine distinct light olive brown (2.5Y 5/6) iron stains; strong effervescence; strongly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 6 to 16 inches

Depth to carbonates: 10 to 32 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 45 to more than 60 inches

A horizon:

Hue—10YR

Value—3 to 5 (2 or 3 moist)

Chroma—1 or 2

Texture—silt loam or silty clay loam

Bw horizon:

Hue—10YR or 2.5Y

Value—4 to 6 (3 to 5 moist)

Chroma—2 to 4

Texture—silt loam or silty clay loam

Bk horizon:

Hue—10YR or 2.5Y

Value—6 to 8 (4 to 6 moist)

Chroma—2 to 4

Texture—silt loam or silty clay loam

C horizon:

Hue—2.5Y

Value—5 to 8 (4 to 6 moist)

Chroma—2 to 4

Texture—mainly silt loam or silty clay loam; varved very fine sand to clay in some pedons

Hamerly Series

Depth to bedrock: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderately slow

Landform: Till plains

Parent material: Loamy glacial till

Slope: 0 to 6 percent

Typical Pedon

Hamerly loam, in an area of Hamerly-Parnell complex, 650 feet south and 100 feet west of the northeast corner of sec. 15, T. 121 N., R. 55 W.

Ap—0 to 11 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; about 3 percent pebbles; strong effervescence; slightly alkaline; abrupt smooth boundary.

Bk1—11 to 23 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common fine accumulations of carbonate; about 5 percent pebbles; violent effervescence; slightly alkaline; clear smooth boundary.

Bk2—23 to 28 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; common medium prominent gray (5Y 5/1) mottles; moderate medium and coarse subangular blocky structure parting to weak medium granular; slightly hard, friable, slightly sticky and slightly plastic; common fine accumulations of carbonate; about 5 percent pebbles; violent effervescence; slightly alkaline; clear wavy boundary.

C—28 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; many coarse prominent gray (5Y 5/1) mottles; massive; hard, firm, slightly sticky and plastic; few medium prominent yellowish brown (10YR 5/6) iron stains; about 5 percent pebbles; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches

Depth to carbonates: 0 to 6 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 40 to more than 60 inches

Other features: A Bky or Bkyz horizon in some pedons

A horizon:

Hue—10YR or 2.5Y

Value—3 to 5 (2 or 3 moist)
 Chroma—1 or 2
 Texture—loam, silt loam, or clay loam

Bk horizon:

Hue—10YR, 2.5Y, or 5Y
 Value—4 to 8 (3 to 7 moist)
 Chroma—1 to 4
 Texture—loam or clay loam

C horizon:

Hue—10YR, 2.5Y, or 5Y
 Value—5 to 8 (4 to 6 moist)
 Chroma—1 to 4
 Texture—loam or clay loam

Harmony Series

Depth to bedrock: Very deep

Drainage class: Moderately well drained

Permeability: Moderately slow in the upper part,
 moderate to slow in the lower part

Landform: Lake plains

Parent material: Clayey glaciolacustrine sediments

Slope: 0 to 2 percent

Typical Pedon

Harmony silty clay loam, in an area of Harmony-Aberdeen silty clay loams, 1,740 feet west and 144 feet south of the northeast corner of sec. 3, T. 124 N., R. 59 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium and fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; neutral; abrupt smooth boundary.

A—7 to 10 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium and fine subangular blocky structure parting to weak medium and fine granular; slightly hard, friable, slightly sticky and slightly plastic; neutral; common very fine roots; neutral; clear wavy boundary.

Bt—10 to 26 inches; dark gray (10YR 4/1) and grayish brown (10YR 5/2) silty clay, very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine angular blocky; hard, firm, sticky and plastic; common very fine roots; continuous shiny films on faces of peds; neutral; clear wavy boundary.

Bk1—26 to 30 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse and medium subangular blocky structure; hard, friable, sticky and slightly plastic; few very fine roots; common fine accumulations of

carbonate; strong effervescence; slightly alkaline; clear wavy boundary.

Bk2—30 to 36 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse and medium subangular blocky structure; hard, friable, sticky and slightly plastic; common fine and few medium accumulations of carbonate; strong effervescence; slightly alkaline; clear wavy boundary.

C1—36 to 46 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine accumulations of carbonate; strong effervescence; slightly alkaline; gradual wavy boundary.

C2—46 to 60 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine accumulations of carbonate; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 30 inches

Depth to carbonates: 16 to 38 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 40 to more than 60 inches

A horizon:

Hue—10YR
 Value—3 or 4 (2 or 3 moist)
 Chroma—1
 Texture—silt loam and silty clay loam

Bt horizon:

Hue—10YR or 2.5Y
 Value—4 to 6 (3 or 4 moist)
 Chroma—1 to 3
 Texture—silty clay loam or silty clay

Bk horizon:

Hue—10YR, 2.5Y, or 5Y
 Value—5 to 8 (4 to 6 moist)
 Chroma—2 to 4
 Texture—clay loam, silty clay loam, silt loam, or loam

C horizon:

Hue—2.5Y or 5Y
 Value—6 to 8 (4 to 6 moist)
 Chroma—2 to 4
 Texture—silt loam, loam, or silty clay loam; varved very fine sand to clay in some pedons
 Other features—varved in the lower part in some pedons with very fine sand, silt, or silty clay

Harriet Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Very slow
Landform: Flood plains
Parent material: Clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Harriet loam, 2,178 feet east and 141 feet north of the southwest corner of sec. 8, T. 121 N., R. 59 W.

A—0 to 1 inch; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; few fine nests of salts; moderately alkaline; abrupt smooth boundary.

Bt_{nz}—1 to 5 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; weak medium columnar structure parting to moderate medium and fine angular blocky; very hard, firm, sticky and plastic; common fine and very fine roots; thin continuous gray (10YR 6/1) coatings on the tops of columns; many fine nests of salts; strong effervescence; moderately alkaline; clear wavy boundary.

B_z—5 to 10 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; weak medium and fine subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; many fine nests of salts; strong effervescence; moderately alkaline; clear wavy boundary.

B_{zg}—10 to 16 inches; dark gray (5Y 4/1) silty clay, very dark gray (5Y 3/1) moist; weak medium and fine subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; common fine nests of salts; strong effervescence; moderately alkaline; clear wavy boundary.

Cg₁—16 to 24 inches; dark gray (5Y 4/1) clay loam, very dark gray (5Y 3/1) moist; massive; very hard, firm, sticky and plastic; few very fine roots; common fine nests of salts; strong effervescence; strongly alkaline; gradual wavy boundary.

Cg₂—24 to 33 inches; olive gray (5Y 5/2) clay loam, olive gray (5Y 4/2) moist; common fine prominent dark yellowish brown (10YR 4/4) mottles; massive; very hard, firm, sticky and plastic; common fine stains of manganese oxide; few fine nests of gypsum and other salts; weak effervescence; moderately alkaline; gradual wavy boundary.

Cg₃—33 to 46 inches; light olive gray (5Y 6/2) clay loam, olive (5Y 5/3) moist; few fine prominent yellowish brown (10YR 5/6) mottles; massive; very hard, firm, sticky and plastic; few fine nests of

gypsum and other salts; slight effervescence; strongly alkaline; gradual wavy boundary.

Cg₄—46 to 60 inches; light olive gray (5Y 6/2) clay loam, olive (5Y 5/3) moist; common fine prominent yellowish brown (10YR 5/6) and few fine prominent dark yellowish brown (10YR 4/4) mottles; massive; very hard, firm, sticky and plastic; common fine and medium nests of gypsum and other salts; slight effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 14 to 26 inches

Depth to carbonates: 0 to 11 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 0 to 11 inches

Other features: Some pedons have an E horizon 1 to 3 inches thick.

E horizon (if it occurs):

Hue—10YR, 2.5Y, or neutral

Value—4 to 7 (2 to 5 moist)

Chroma—0 or 1

Texture—loam, silt loam, or very fine sandy loam

B_{tn} horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 to 5 (2 to 4 moist)

Chroma—0 to 2

Texture—mainly clay loam or silty clay loam; silty clay or clay in some pedons

C horizon:

Hue—10YR, 2.5Y, 5Y, or 5GY

Value—4 to 7 (3 to 5 moist)

Chroma—1 to 4

Texture—mainly clay, silty clay, or clay loam; very fine sandy loam, sandy loam, or loam in some pedons

Hetland Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Slow

Landform: Ice-walled lake plains

Parent material: Clayey glaciolacustrine sediments

Slope: 0 to 6 percent

Typical Pedon

Hetland silty clay loam, 0 to 2 percent slopes, 1,240 feet west and 340 feet north of the southeast corner of sec. 36, T. 120 N., R. 56 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate

medium granular; slightly hard, friable, slightly sticky and plastic; few fine and common very fine roots; neutral; abrupt smooth boundary.

Bw1—9 to 20 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, sticky and plastic; few fine and common very fine roots; many distinct shiny films on faces of peds; neutral; clear wavy boundary.

Bw2—20 to 29 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, friable, sticky and plastic; few fine roots; common distinct shiny films on faces of peds; few very dark gray (10YR 3/1) tongues $\frac{1}{8}$ to $\frac{3}{8}$ inch wide; neutral; clear wavy boundary.

Bk—29 to 37 inches; light olive brown (2.5Y 5/4) silty clay loam, olive brown (2.5Y 4/4) moist; weak coarse subangular blocky structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and plastic; few medium prominent yellowish brown (10YR 5/6) iron stains; few medium accumulations of carbonate; violent effervescence; slightly alkaline; clear wavy boundary.

C1—37 to 52 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and plastic; few medium prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 4/6) iron stains; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—52 to 60 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, sticky and plastic; varves 1 to 3 millimeters thick; common medium prominent yellowish brown (10YR 5/6) and many medium strong brown (7.5YR 4/6) iron stains; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 26 inches

Depth to carbonates: 16 to 32 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1

Texture—silty clay loam or silty clay

Bt horizon:

Hue—10YR or 2.5Y

Value—3 to 6 (2 to 5 moist)

Chroma—1 to 3

Texture—silty clay or silty clay loam

Bk horizon:

Hue—10YR, 2.5Y, or 5Y

Value—5 to 7 (4 to 6 moist)

Chroma—1 to 4

Texture—silty clay or silty clay loam

C horizon:

Hue—10YR, 2.5Y, or 5Y

Value—5 to 7 (4 to 6 moist)

Chroma—1 to 4

Texture—silty clay loam or silt loam

Holmquist Series

Depth to bedrock: Very deep

Drainage class: Poorly drained

Permeability: Moderate

Landform: Flood plains

Parent material: Loamy alluvium

Slope: 0 to 2 percent

Typical Pedon

Holmquist loam, in an area of La Prairie-Holmquist loams, channeled, 120 feet north and 2,030 feet east of the southwest corner of sec. 18, T. 123 N., R. 58 W.

Az—0 to 8 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable; many fine roots; common fine nests of salts; strong effervescence; moderately alkaline; clear wavy boundary.

Cz1—8 to 17 inches; grayish brown (2.5Y 5/2) loam stratified with thin lenses of fine sandy loam, very dark grayish brown (2.5Y 3/2) moist; few fine prominent yellowish brown (10YR 5/6) mottles; massive; slightly hard, friable; common fine roots; many fine nests of salts; strong effervescence; strongly alkaline; gradual wavy boundary.

Cz2—17 to 26 inches; grayish brown (2.5Y 5/2) sandy loam stratified with thin lenses of loamy fine sand, dark grayish brown (2.5Y 4/2) moist; common fine prominent dark yellowish brown (10YR 4/6) mottles; massive; slightly hard, very friable; few fine roots; common fine nests of salts; strong effervescence; strongly alkaline; gradual wavy boundary.

Czg—26 to 46 inches; gray (5Y 5/1) and dark gray (5Y 4/1) loam, very dark gray (5Y 3/1) and black (5Y 2.5/1) moist; common fine and medium prominent dark yellowish brown (10YR 3/6) mottles; massive; hard, friable, slightly sticky and slightly plastic; few fine roots; few fine nests of salts; strong

effervescence; moderately alkaline; gradual wavy boundary.

Cg—46 to 60 inches; gray (5Y 6/1) sandy loam stratified with lenses of coarse sand, dark gray (5Y 4/1) moist; many fine prominent dark yellowish brown (10YR 3/6) mottles; massive; hard, firm, sticky and plastic; slight effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 0 to 11 inches

A horizon:

Hue—10YR or 2.5Y

Value—3 to 5 (2 or 3 moist)

Chroma—1 to 3

Texture—loam, fine sandy loam, or sandy loam

C horizon:

Hue—10YR, 2.5Y, or 5Y

Value—3 to 7 (2.5 to 5 moist)

Chroma—1 to 4

Texture—stratified fine sandy loam to clay loam

Huffton Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Moderate in the upper part, moderate to slow in the lower part

Landform: Lake plains

Parent material: Silty glaciolacustrine sediments

Slope: 2 to 9 percent

Typical Pedon

Huffton silt loam, in an area of Great Bend-Zell-Huffton silt loams, 4 to 9 percent slopes, 1,100 feet south and 150 feet west of the northeast corner of sec. 7, T. 124 N., R. 59 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; strong effervescence; slightly alkaline; abrupt smooth boundary.

Bkz1—7 to 16 inches; light gray (2.5Y 7/2) silt loam, olive brown (2.5Y 4/4) moist; weak coarse and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common fine nests of gypsum and other salts; violent effervescence; moderately alkaline; clear wavy boundary.

Bkz2—16 to 25 inches; pale yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; weak coarse and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common fine nests of salts; violent effervescence; moderately alkaline; clear wavy boundary.

Cz1—25 to 30 inches; pale yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common fine nests of salts; varves 1 to 2 millimeters thick; strong effervescence; moderately alkaline; clear wavy boundary.

Cz2—30 to 35 inches; pale yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine nests of salts; varves 1 to 2 millimeters thick; strong effervescence; moderately alkaline; clear wavy boundary.

C—35 to 60 inches; pale yellow (2.5Y 7/4) and gray (10YR 6/1) silt loam, light yellowish brown (2.5Y 6/4) and gray (10YR 5/1) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; varves 1 to 2 millimeters thick; common fine prominent yellowish brown (10YR 5/8) iron stains; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 6 to 16 inches

Depth to carbonates: 0 to 10 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 6 to 35 inches

A horizon:

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1 or 2

Texture—silt loam, very fine sandy loam, or loam

Bk horizon:

Hue—10YR or 2.5Y

Value—5 to 7 (3 to 6 moist)

Chroma—2 to 4

Texture—silt loam, loam, or very fine sandy loam

C horizon:

Hue—2.5Y

Value—6 to 8 (4 to 6 moist)

Chroma—2 to 4

Texture—silt loam, loam, or very fine sandy loam

Kloten Series

Depth to bedrock: Shallow

Drainage class: Well drained

Permeability: Moderate in the loamy sediments and very slow in the underlying shale

Landform: Moraines

Parent material: Loamy glacial till over shale bedrock

Slope: 9 to 40 percent

Typical Pedon

Kloten silt loam, in an area of Kloten-Buse complex, 9 to 40 percent slopes, 75 feet east and 165 feet north of the southwest corner of sec. 4, T. 124 N., T. 58 W.

A—0 to 6 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; about 1 percent pebbles; neutral; clear smooth boundary.

C—6 to 14 inches; dark grayish brown (2.5Y 4/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; massive; hard, firm, sticky and plastic; common fine roots; about 1 percent pebbles; about 10 percent shale fragments; neutral; gradual wavy boundary.

Cr—14 to 60 inches; gray (2.5Y 6/1) shale, dark gray (2.5Y 4/1) moist; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches

Depth to carbonates: 9 to more than 60 inches

Depth to contrasting or impervious layer: 12 to 20 inches over shale

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR or 2.5Y

Value—3 to 5 (2 or 3 moist)

Chroma—1 or 2

Texture—loam, silt loam, silty clay loam, or clay loam

C horizon:

Hue—10YR, 2.5Y, or 5Y

Value—4 to 6 (3 to 5 moist)

Chroma—1 or 2

Texture—loam, silt loam, silty clay loam, or clay loam

2Cr horizon:

Hue—2.5Y, 5Y, or neutral

Value—5 to 7 (3 to 5 moist)

Chroma—0 to 3

Type of bedrock—bedded shale

Permeability: Moderately slow

Landform: Till plains

Parent material: Loess or silty glacial till over loamy glacial till

Slope: 0 to 6 percent

Typical Pedon

Kranzburg silt loam, in an area of Kranzburg-Brookings silt loams, 0 to 2 percent slopes, 100 feet west and 220 feet south of the northeast corner of sec. 22, T. 124 N., R. 58 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly plastic; common fine roots; moderately acid; abrupt smooth boundary.

Bw1—9 to 14 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly plastic; few very fine roots; neutral; clear wavy boundary.

Bw2—14 to 27 inches; brown (10YR 5/3) silt loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; neutral; gradual wavy boundary.

2Bk—27 to 39 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common medium accumulations of carbonate; about 5 percent pebbles; violent effervescence; moderately alkaline; gradual wavy boundary.

2C—39 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; massive; hard, firm, sticky and plastic; few fine accumulations of carbonate; about 5 percent pebbles; strong effervescence; strongly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches

Depth to carbonates: 19 to 32 inches

Depth to contrasting or impervious layer: 20 to 40 inches over loamy glacial till

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1

Texture—silty clay loam or silt loam

Bw horizon:

Hue—10YR or 2.5Y

Kranzburg Series

Depth to bedrock: Very deep

Drainage class: Well drained

Value—3 to 5 (2 to 4 moist)
 Chroma—2 or 3
 Texture—silty clay loam or silt loam

2Bk horizon:

Hue—10YR or 2.5Y
 Value—5 to 7 (4 to 6 moist)
 Chroma—2 to 4
 Texture—loam or clay loam

2C horizon:

Hue—10YR or 2.5Y
 Value—5 to 7 (4 to 6 moist)
 Chroma—2 to 4
 Texture—clay loam or loam

La Prairie Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 2 percent

Typical Pedon

La Prairie loam, in an area of La Prairie-Holmquist loams, channeled, 2,170 feet north and 110 feet west of the southeast corner of sec. 21, T. 124 N., R. 58 W.

A1—0 to 8 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, very friable; many fine roots; slightly alkaline; clear wavy boundary.

A2—8 to 16 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak coarse subangular blocky structure parting to moderate medium granular; slightly hard, friable; slightly plastic; many fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

Bw—16 to 31 inches; gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure parting to moderate medium granular; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

C—31 to 48 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

Ab—48 to 60 inches; gray (10YR 5/1) clay loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic;

strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 50 inches

Depth to carbonates: 0 to 40 inches

Depth to contrasting or impervious layer: 40 to more than 60 inches over clayey or sandy material

Depth to gypsum and other salts: More than 60 inches

Other features: A Bk horizon in some pedons

A horizon:

Hue—10YR or neutral
 Value—3 or 4 (2 or 3 moist)
 Chroma—0 or 1
 Texture—loam, silt loam, clay loam, or silty clay loam

Bw horizon:

Hue—10YR or 2.5Y
 Value—3 to 5 (2 to 4 moist)
 Chroma—1 to 3
 Texture—loam, clay loam, silt loam, or silty clay loam

C horizon:

Hue—10YR, 2.5Y, or 5Y
 Value—4 to 7 (3 to 5 moist)
 Chroma—1 to 4
 Texture—loam, clay loam, silt loam, or silty clay loam

Lamoure Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landform: Flood plains
Parent material: Silty alluvium
Slope: 0 to 2 percent

Typical Pedon

Lamoure silty clay loam, 125 feet south and 1,370 feet west of the northeast corner of sec. 21, T. 124 N., R. 58 W.

A1—0 to 12 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; hard, friable, slightly sticky and slightly plastic; many fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

A2—12 to 28 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak coarse subangular blocky structure parting to weak fine subangular blocky; hard, friable, sticky and plastic; common very fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

Cg1—28 to 36 inches; gray (5Y 6/1) silty clay loam,

dark gray (5Y 4/1) moist; few fine prominent yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

Cg2—36 to 56 inches; light olive gray (5Y 6/2) silty clay loam, olive gray (5Y 5/2) moist; common medium prominent yellowish brown (10YR 5/6) mottles; massive; hard, friable, slightly sticky and slightly plastic; strong effervescence; slightly alkaline; gradual wavy boundary.

Cg3—56 to 60 inches; gray (5Y 6/1), stratified clay loam and gravelly clay loam, olive gray (5Y 5/2) moist; common fine prominent yellowish brown (10YR 5/6) mottles; massive; hard, firm, sticky and plastic; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to more than 60 inches

Depth to carbonates: 0 to 10 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 to 5 (2 or 3 moist)

Chroma—0 or 1

Texture—silty clay loam or silt loam

Cg horizon:

Hue—2.5Y, 5Y, or neutral

Value—4 to 8 (2 to 6 moist)

Chroma—0 to 2

Texture—silty clay loam or silt loam

Langhei Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Moraines

Parent material: Loamy glacial till

Slope: 25 to 40 percent

Typical Pedon

Langhei clay loam, in an area of Buse-Langhei complex, 15 to 40 percent slopes, 45 feet west and 840 feet north of the southeast corner of sec. 7, T. 124 N., R. 56 W.

A—0 to 4 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, sticky and

plastic; many fine roots; about 5 percent pebbles; strong effervescence; slightly alkaline; clear wavy boundary.

C1—4 to 19 inches; light brownish gray (2.5Y 6/2) clay loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable, sticky and plastic; common very fine roots; few fine accumulations of carbonate; about 5 percent pebbles; strong effervescence; moderately alkaline; clear wavy boundary.

C2—19 to 60 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, sticky and plastic; about 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 5 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR or 2.5Y

Value—5 to 7 (3 to 5 moist)

Chroma—1 or 2

Texture—clay loam or loam

C horizon:

Hue—10YR or 2.5Y

Value—5 to 8 (4 to 7 moist)

Chroma—2 to 4

Texture—loam or clay loam

Lowe Series

Depth to bedrock: Very deep

Drainage class: Poorly drained

Permeability: Moderate

Landform: Flood plains

Parent material: Loamy alluvium

Slope: 0 to 2 percent

Typical Pedon

Lowe loam, 2,880 feet south and 280 feet west of the northeast corner of sec. 13, T. 117 N., R. 58 W., in Clark County:

A—0 to 8 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak medium and fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine and fine vesicular pores; strong effervescence (about 36 percent calcium carbonate equivalent); slightly alkaline; clear smooth boundary.

Bk1—8 to 18 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky

and slightly plastic; common very fine roots; common very fine vesicular pores; many fine rounded soft accumulations of carbonate; violent effervescence (about 45 percent calcium carbonate equivalent); moderately alkaline; clear smooth boundary.

Bk2—18 to 34 inches; gray (10YR 6/1) loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine vesicular and common very fine and fine tubular pores; many fine rounded soft accumulations of carbonate; violent effervescence (about 45 percent calcium carbonate equivalent); slightly alkaline; gradual wavy boundary.

Cg1—34 to 56 inches; light gray (5Y 7/1) silt loam, olive gray (5Y 5/2) moist; common fine prominent strong brown (7.5YR 5/8) mottles; massive; slightly hard, very friable; few very fine roots; many very fine vesicular and tubular pores; strong effervescence (about 9 percent calcium carbonate equivalent); slightly alkaline; clear wavy boundary.

Cg2—56 to 60 inches; light gray (5Y 7/1) gravelly loam, gray (5Y 6/1) moist; few fine prominent strong brown (7.5YR 5/6) mottles; massive; slightly hard, friable; 20 percent pebbles mixed; strong effervescence (about 9 percent calcium carbonate equivalent); slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 24 inches

Depth to carbonates: 0 to 10 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 15 to more than 60 inches

Other features: An Akb or Ab horizon in some pedons

A horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 or 4 (2 or 3 moist)

Chroma—0 or 1

Texture—loam, clay loam, silt loam, or silty clay loam

Bk horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 to 7 (2 to 5 moist)

Chroma—0 to 2

Texture—mainly loam or clay loam; silt loam in some pedons

Cg horizon:

Hue—2.5Y or 5Y

Value—4 to 7 (3 to 6 moist)

Chroma—1 to 3

Texture—stratified gravelly loam, silt loam, loam,

clay loam, or sandy loam; silty clay loam, sandy clay loam, or loamy sand in some pedons

Ludden Series

Depth to bedrock: Very deep

Drainage class: Poorly drained and very poorly drained

Permeability: Slow

Landform: Flood plains

Parent material: Clayey alluvium

Slope: 0 to 1 percent

Typical Pedon

Ludden silty clay, 400 feet north and 150 feet west of the southeast corner of sec. 7, T. 124 N., R. 59 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; weak medium and fine subangular blocky structure; very hard, firm, sticky and plastic; common very fine roots; neutral; abrupt smooth boundary.

Bw1—7 to 13 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate fine and very fine angular blocky; very hard, firm, sticky and very plastic; common very fine roots; slight effervescence; moderately alkaline; clear wavy boundary.

Bw2—13 to 20 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure parting to moderate fine and very fine angular blocky; very hard, firm, sticky and very plastic; few very fine roots; common medium and fine accumulations of carbonate; strong effervescence; moderate alkaline; clear wavy boundary.

Bg—20 to 31 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; moderate medium subangular blocky structure parting to moderate fine and very fine angular blocky; very hard, firm, sticky and very plastic; few very fine roots; common fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

Bzg1—31 to 42 inches; gray (5Y 5/1) silty clay, dark gray (5Y 4/1) moist; weak coarse and medium subangular blocky structure parting to moderate fine and very fine angular blocky; hard, firm, sticky and plastic; few fine accumulations of carbonate; common fine nests of gypsum and other salts; strong effervescence; moderately alkaline; clear wavy boundary.

Bzg2—42 to 52 inches; gray (5Y 6/1) silty clay, dark gray (5Y 4/1) moist; weak coarse and medium subangular blocky structure parting to moderate fine and very fine angular blocky; hard, firm, sticky and

plastic; few fine accumulations of carbonate; common fine nests of gypsum and other salts; strong effervescence; moderately alkaline; clear wavy boundary.

Cg—52 to 60 inches; light olive gray (5Y 6/2) silty clay, olive gray (5Y 5/2) moist; few fine prominent yellowish brown (10YR 5/6) mottles; massive; hard, firm, sticky and plastic; common medium and fine nests of gypsum; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 48 inches

Depth to carbonates: 0 to 10 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 0 to 30 inches

A horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 to 5 (2 or 3 moist)

Chroma—0 or 1

Texture—silty clay, clay, or silty clay loam

B horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—4 to 6 (2 to 4 moist)

Chroma—0 to 2

Texture—clay, silty clay, or silty clay loam

Cg horizon:

Hue—2.5Y, 5Y, or neutral

Value—3 to 6 (2 to 5 moist)

Chroma—0 to 2

Texture—clay or silty clay

Maddock Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Rapid

Landform: Outwash plains

Parent material: Sandy glaciofluvial sediments

Slope: 0 to 12 percent

Typical Pedon

Maddock sandy loam, in an area of Maddock-Egeland sandy loams, 6 to 12 percent slopes, 2,415 feet south and 2,520 feet west of the northeast corner of sec. 6, T. 122 N., R. 55 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) sandy loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak medium granular; slightly hard, very friable; common fine roots; slightly alkaline; abrupt smooth boundary.

Bw1—9 to 15 inches; dark grayish brown (10YR 4/2)

loamy sand, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; soft, very friable; few fine roots; slightly alkaline; clear wavy boundary.

Bw2—15 to 27 inches; brown (10YR 5/3) loamy sand, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure or single grain; soft, very friable; few fine roots; slightly alkaline; clear smooth boundary.

C1—27 to 52 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grain; loose; slight effervescence; moderately alkaline; gradual wavy boundary.

C2—52 to 60 inches; brown (10YR 5/3) sand, brown (10YR 4/3) moist; single grain; loose; slight effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches

Depth to carbonates: 0 to 40 inches

Depth to contrasting or impervious layer: 40 to more than 60 inches over loamy material

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR

Value—3 to 5 (2 or 3 moist)

Chroma—1 or 2

Texture—sandy loam, fine sandy loam, loam, loamy fine sand, fine sand, or loamy sand

Bw horizon:

Hue—10YR

Value—4 to 6 (2 to 5 moist)

Chroma—2 to 4

Texture—fine sand, loamy fine sand, or loamy sand

C horizon:

Hue—10YR or 2.5Y

Value—4 to 7 (3 to 6 moist)

Chroma—2 to 4

Texture—fine sand, loamy fine sand, loamy sand, or sand

Marysland Series

Depth to bedrock: Very deep

Drainage class: Poorly drained

Permeability: Moderate in the loamy sediments and rapid in the underlying gravelly material

Landform: Flood plains

Parent material: Loamy alluvium over glacial outwash

Slope: 0 to 2 percent

Typical Pedon

Marysland loam, in an area of Marysland-Divide loams,

2,135 feet east and 2,470 feet south of the northwest corner of sec. 2, T. 121 N., R. 53 W.

A1—0 to 9 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; hard, friable, slightly sticky and slightly plastic; many very fine roots; slight effervescence; moderately alkaline; clear smooth boundary.

A2—9 to 14 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to moderate medium granular; hard, friable, slightly sticky and slightly plastic; many very fine roots; strong effervescence; moderately alkaline; clear smooth boundary.

Bkg1—14 to 24 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; few fine prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; violent effervescence; moderately alkaline; clear smooth boundary.

Bkg2—24 to 30 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; common medium prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; hard, friable; violent effervescence; moderately alkaline; abrupt wavy boundary.

2C1—30 to 46 inches; light gray (2.5Y 7/2) gravelly sand, light brownish gray (2.5Y 6/2) moist; single grain; loose; about 25 percent gravel; slight effervescence; moderately alkaline; gradual wavy boundary.

2C2—46 to 60 inches; light yellowish brown (2.5Y 6/4) gravelly sand, light olive brown (2.5Y 5/4) moist; single grain; loose; about 25 percent gravel; slight effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 30 inches

Depth to carbonates: 0 to 7 inches

Depth to contrasting or impervious layer: 20 to 40 inches over gravelly material

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 or 4 (2 or 3 moist)

Chroma—0 or 1

Texture—loam, silt loam, sandy clay loam, or clay loam

Bkg horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—4 to 8 (3 to 6 moist)

Chroma—0 to 2

Texture—loam, clay loam, or sandy clay loam; fine sandy loam or sandy loam in some pedons

2C horizon:

Hue—2.5Y or 5Y

Value—4 to 7 (3 to 6 moist)

Chroma—1 or 2

Texture—fine sand, sand, or coarse sand; loamy sand, loamy coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand in some pedons

Mauvais Series

Depth to bedrock: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderately slow

Landform: Wave-cut platforms

Parent material: Loamy glacial till

Slope: 2 to 6 percent

Typical Pedon

Mauvais clay loam, 2 to 6 percent slopes, 2,185 feet west and 2,175 feet north of the southeast corner of sec. 5, T. 122 N., R. 54 W.

A—0 to 4 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and plastic; many medium and fine roots; about 5 percent pebbles; slight effervescence; moderately alkaline; clear smooth boundary.

C—4 to 18 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; many coarse prominent yellowish brown (10YR 5/6) and common medium distinct brown (10YR 5/3) mottles; massive; hard, firm, sticky and plastic; few medium and common fine roots; about 5 percent pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

Czg—18 to 60 inches; olive gray (5Y 5/2) clay loam, olive gray (5Y 4/2) moist; common medium prominent yellowish brown (10YR 5/4) mottles; massive; hard, firm, sticky and plastic; few fine roots to a depth of 36 inches; common medium accumulations of gypsum; about 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 6 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 10 to more than 60 inches

A horizon:

Hue—10YR, 2.5Y, or 5Y

Value—3 to 5 (2 to 4 moist)

Chroma—1 or 2

Texture—loam, clay loam, silty clay loam, silt loam, or sandy loam

C horizon:

Hue—2.5Y, 5Y, or neutral

Value—5 to 7 (4 to 6 moist)

Chroma—0 to 4

Texture—loam, clay loam, silt loam, or silty clay loam

Minnewasta Series*Depth to bedrock:* Very deep*Drainage class:* Somewhat poorly drained*Permeability:* Rapid in the sandy sediments and slow in the underlying glacial till*Landform:* Beach terraces*Parent material:* Sandy lacustrine sediments over loamy glacial till*Slope:* 0 to 6 percent**Typical Pedon**

Minnewasta sandy loam, 0 to 2 percent slopes, 1,845 feet west and 335 feet north of the southeast corner of sec. 10, T. 121 N., R. 54 W.

A—0 to 4 inches; very dark gray (10YR 3/1) sandy loam, black (10YR 2/1) moist; weak medium granular structure or single grain; soft, very friable; many fine roots; moderately alkaline; clear smooth boundary.

C1—4 to 9 inches; light brownish gray (2.5Y 6/2) coarse sand, grayish brown (2.5Y 5/2) moist; single grain; loose; common fine roots; slight effervescence; moderately alkaline; clear smooth boundary.

C2—9 to 16 inches; grayish brown (2.5Y 5/2) sand, dark grayish brown (2.5Y 4/2) moist; few fine prominent yellowish brown (10YR 5/6) mottles; single grain; loose; few fine roots; strong effervescence; strongly alkaline; clear wavy boundary.

2Cg1—16 to 22 inches; light gray (5Y 7/2) sandy clay loam, olive gray (5Y 5/2) moist; common medium prominent brownish yellow (10YR 6/6) mottles; massive; very hard, firm, sticky and plastic; few fine roots; about 5 percent pebbles; strong effervescence; strongly alkaline; gradual wavy boundary.

2Cg2—22 to 60 inches; light gray (5Y 7/2) clay loam, gray (5Y 5/1) moist; many coarse prominent yellowish brown (10YR 5/6) mottles; massive; very

hard, firm, sticky and plastic; about 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics*Depth to carbonates:* 0 to 10 inches*Depth to contrasting or impervious layer:* 10 to 20 inches over glacial till*Depth to gypsum and other salts:* 16 to more than 60 inches*A horizon:*

Hue—10YR or 2.5Y

Value—3 or 4 (2 or 3 moist)

Chroma—1 or 2

Texture—sandy loam, loam, fine sandy loam, loamy sand, or gravelly sand

C horizon:

Hue—2.5Y or 5Y

Value—5 to 7 (4 or 5 moist)

Chroma—2 to 4

Texture—mainly coarse sand or sand; loamy fine sand, loamy sand, or gravelly sand in some pedons

2C horizon:

Hue—2.5Y or 5Y

Value—5 to 7 (4 to 6 moist)

Chroma—1 to 4

Texture—sandy clay loam or clay loam

Minnewaukan Series*Depth to bedrock:* Very deep*Drainage class:* Poorly drained*Permeability:* Rapid*Landform:* Beach terraces*Parent material:* Sandy lacustrine sediments*Slope:* 0 to 2 percent**Typical Pedon**

Minnewaukan loamy sand, 2,150 feet north and 210 feet east of the southwest corner of sec. 18, T. 121 N., R. 55 W.

A—0 to 4 inches; dark gray (10YR 4/1) loamy sand, black (10YR 2/1) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky; common fine and medium roots; slight effervescence; slightly alkaline; clear smooth boundary.

CA—4 to 9 inches; grayish brown (2.5Y 5/2) loamy sand, dark grayish brown (2.5Y 4/2) moist; few fine prominent yellowish brown (10YR 5/6) mottles; weak fine granular structure or single grain; loose, slightly sticky; few fine roots; slight effervescence; slightly alkaline; clear smooth boundary.

C1—9 to 18 inches; grayish brown (2.5Y 5/2) fine sand, dark grayish brown (2.5Y 4/2) moist; few fine prominent yellowish brown (10YR 5/4) mottles; single grain; loose; few fine roots; slight effervescence; slightly alkaline; clear smooth boundary.

C2—18 to 22 inches; light gray (2.5Y 7/2) sand, grayish brown (2.5Y 5/2) moist; common fine prominent yellowish brown (10YR 5/4) mottles; single grain; loose; slight effervescence; slightly alkaline; clear smooth boundary.

C3—22 to 31 inches; light gray (2.5Y 7/2) loamy sand, grayish brown (2.5Y 5/2) moist; few fine prominent yellowish brown (10YR 5/4) mottles; single grain; loose; slight effervescence; slightly alkaline; clear smooth boundary.

Cg1—31 to 43 inches; light brownish gray (2.5Y 6/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; few medium prominent yellowish brown (10YR 5/4) mottles; single grain; loose; slight effervescence; moderately alkaline; gradual wavy boundary.

Cg2—43 to 60 inches; light brownish gray (2.5Y 6/2) loamy sand, dark grayish brown (2.5Y 4/2) moist; few medium prominent yellowish brown (10YR 5/4) mottles; single grain; loose; slight effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches

Depth to contrasting or impervious layer: 40 to more than 60 inches over loamy material

Depth to gypsum and other salts: 30 to more than 60 inches

A horizon:

Hue—10YR, 2.5Y, or 5Y

Value—3 to 6 (2 to 4 moist)

Chroma—1 or 2

Texture—loamy fine sand, loamy sand, loamy coarse sand, fine sandy loam, sandy loam, or sand

C horizon:

Hue—10YR, 2.5Y, 5Y, or 5GY

Value—4 to 7 (3 to 5 moist)

Chroma—1 to 4

Texture—loamy sand, sand, fine sand, or loamy coarse sand

Nahon Series

Depth to bedrock: Very deep

Drainage class: Moderately well drained

Permeability: Very slow

Landform: Lake plains

Parent material: Silty and clayey glaciolacustrine sediments

Slope: 0 to 2 percent

Typical Pedon

Nahon silt loam, in an area of Nahon-Aberdeen-Exline silt loams, 2,455 feet east and 100 feet south of the northwest corner of sec. 30, T. 124 N., R. 59 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; slightly acid; abrupt smooth boundary.

E—7 to 8 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak thin platy structure; slightly hard; friable; common very fine roots; neutral; abrupt smooth boundary.

Btn1—8 to 15 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate medium columnar structure parting to strong medium and fine angular blocky; very hard, firm, sticky and plastic; common very fine roots; thin continuous gray (10YR 6/1) coatings on the tops of columns; thin continuous shiny films on vertical faces of peds; neutral; clear wavy boundary.

Btn2—15 to 19 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to strong medium and fine angular blocky; very hard, firm, sticky and plastic; common very fine roots; thin continuous shiny films on vertical faces of peds; slightly alkaline; clear wavy boundary.

Btnz—19 to 25 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate medium and fine angular blocky; very hard, firm, sticky and plastic; few very fine roots; patchy shiny films on vertical faces of peds; common medium and fine nests of gypsum and other salts; slightly alkaline; clear wavy boundary.

Bz—25 to 31 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak moderate and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine roots; common medium and fine nests of gypsum and other salts; slightly alkaline; clear wavy boundary.

Bkz—31 to 40 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; hard, friable, sticky and slightly plastic; common medium

and fine nests of gypsum and other salts; common fine accumulations of carbonate; violent effervescence; moderately alkaline; gradual wavy boundary.

- C1—40 to 55 inches; light gray (2.5Y 7/2) silty clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable; few medium accumulations of carbonate; violent effervescence; moderately alkaline; gradual wavy boundary.
- C2—55 to 60 inches; white (2.5Y 8/2) and pale yellow (2.5Y 7/4) silty clay loam, light brownish gray (2.5Y 6/2) and light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable; varves 1 to 2 millimeters thick; few fine accumulations of carbonate; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 30 inches
Depth to carbonates: 14 to 32 inches
Depth to contrasting or impervious layer: More than 60 inches
Depth to gypsum and other salts: 16 to 35 inches
Thickness of the surface soil: 6 to 17 inches
Other features: Some pedons that have an Ap horizon do not have an E horizon.

A horizon:

Hue—10YR
 Value—3 or 4 (2 or 3 moist)
 Chroma—1
 Texture—silt loam or silty clay loam

E horizon (if it occurs):

Hue—10YR
 Value—5 or 6 (3 or 4 moist)
 Chroma—1 or 2
 Texture—silt loam or silty clay loam

Btn horizon:

Hue—10YR or 2.5Y
 Value—3 to 5 (2 or 3 moist)
 Chroma—1 to 3
 Texture—silty clay or silty clay loam

Bz or Bkz horizon:

Hue—10YR, 2.5Y, or 5Y
 Value—4 to 8 (3 to 6 moist)
 Chroma—1 to 4
 Texture—mainly silty clay loam or silty clay; silt loam in some pedons

C horizon:

Hue—10YR or 2.5Y
 Value—5 to 8 (4 to 7 moist)
 Chroma—2 to 4
 Texture—silty clay loam, clay, or silty clay

Nutley Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Very slow

Landform: Ice-walled lake plains

Parent material: Clayey glaciolacustrine sediments

Slope: 0 to 6 percent

Typical Pedon

Nutley silty clay, in an area of Sinai-Nutley silty clays, 0 to 2 percent slopes, 360 feet south and 250 feet east of the northwest corner of sec. 8, T. 121 N., R. 58 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate fine granular structure; slightly hard, friable, sticky and plastic; common fine and very fine roots; slight effervescence; moderately alkaline; abrupt smooth boundary.

Bw—7 to 20 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate fine and very fine blocky; hard, firm, sticky and plastic; few fine and very fine roots; common dark gray (10YR 4/1) tongues; slight effervescence; moderately alkaline; gradual wavy boundary.

C1—20 to 48 inches; pale yellow (5Y 7/3) clay, olive (5Y 5/3) moist; common fine prominent yellowish red (5YR 5/6) and common fine distinct gray (5Y 5/1) mottles; weak fine blocky structure; very hard, firm, very sticky and plastic; few dark gray (10YR 4/1) tongues; strong effervescence; moderately alkaline; diffuse wavy boundary.

C2—48 to 60 inches; pale yellow (5Y 7/3) clay, olive (5Y 5/3) moist; many medium prominent yellowish red (5YR 4/6) and many medium distinct gray (5Y 5/1) mottles; weak medium and fine blocky structure; very hard, firm, very sticky and plastic; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting or impervious layer: More than 60 inches
Depth to gypsum and other salts: 40 to more than 60 inches
A horizon:
 Hue—10YR
 Value—3 or 4 (2 or 3 moist)
 Chroma—1
 Texture—silty clay, clay, silty clay loam, or clay loam

Bw horizon:

Hue—10YR, 2.5Y, or 5Y

Value—4 to 6 (3 to 5 moist)

Chroma—1 to 3

Texture—mainly clay or silty clay; silty clay loam in some pedons

C horizon:

Hue—2.5Y or 5Y

Value—6 or 7 (4 to 6 moist)

Chroma—2 to 4

Texture—clay, silty clay, or silty clay loam

Oldham Series

Depth to bedrock: Very deep

Drainage class: Very poorly drained

Permeability: Slow

Landform: Till plains

Parent material: Local clayey alluvium

Slope: 0 to 1 percent

Typical Pedon

Oldham silty clay loam, 460 feet west and 170 feet south of the northeast corner of sec. 35, T. 123 N., R. 57 W.

A—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak medium granular; slightly hard, friable, slightly sticky and slightly plastic; many medium roots; slight effervescence; slightly alkaline; clear wavy boundary.

Bg—8 to 18 inches; dark gray (5Y 4/1) silty clay loam, black (5Y 2.5/1) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, sticky and plastic; common fine roots; few fine accumulations of carbonate; few fine nests of gypsum; few fine snail-shell fragments; strong effervescence; moderately alkaline; clear wavy boundary.

Bkyg—18 to 32 inches; dark gray (5Y 4/1) silty clay loam, black (5Y 2.5/1) moist; few medium prominent dark yellowish brown (10YR 4/4) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, sticky and plastic; few fine roots; few medium accumulations of carbonate; common medium nests of gypsum; violent effervescence; moderately alkaline; clear wavy boundary.

Byg—32 to 47 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; common medium prominent dark yellowish brown (10YR 4/4) mottles; weak coarse prismatic structure; very hard, firm, sticky and plastic; few fine nests of gypsum; strong effervescence; moderately alkaline; gradual wavy boundary.

Cg—47 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common medium prominent dark yellowish brown (10YR 4/4) mottles; massive; very hard, firm, sticky and plastic; few fine snail-shell fragments; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 60 inches

Depth to carbonates: 0 to 10 inches

Depth to contrasting or impervious layer: 40 to more than 60 inches over glacial till

Depth to gypsum and other salts: 20 to more than 60 inches

A horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 or 4 (2 or 3 moist)

Chroma—0 or 1

Texture—silty clay loam or silty clay

Bg horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 to 5 (2 or 3 moist)

Chroma—0 or 1

Texture—silty clay loam or silty clay; silt loam below a depth of 40 inches in some pedons

Bkg or Bkyg horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—2 to 5 (3 to 7 moist)

Chroma—0 to 2

Texture—silty clay loam or silty clay

Cg horizon:

Hue—2.5Y or 5Y

Value—4 to 7 (3 to 5 moist)

Chroma—1 or 2

Texture—silty clay loam, silt loam, clay loam, or silty clay

Parnell Series

Depth to bedrock: Very deep

Drainage class: Very poorly drained

Permeability: Slow

Landform: Till plains and moraines

Parent material: Local clayey alluvium

Slope: 0 to 1 percent

Typical Pedon

Parnell silty clay loam, 115 feet north and 120 feet west of the southeast corner of sec. 28, T. 123 N., R. 58 W.

A1—0 to 6 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; hard, friable, sticky and plastic; many fine

and medium roots; neutral; clear wavy boundary.

A2—6 to 17 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate medium and fine subangular blocky structure; hard, friable, sticky and plastic; common fine roots; neutral; clear wavy boundary.

Btg1—17 to 27 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; few fine roots; shiny films on faces of peds; neutral; gradual wavy boundary.

Btg2—27 to 38 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; few fine roots; shiny films on faces of peds; neutral; gradual wavy boundary.

Cg1—38 to 47 inches; dark gray (N 4/0) clay, very dark grayish brown (2.5Y 3/2) moist; massive; hard, firm, sticky and plastic; slight effervescence; slightly alkaline; gradual wavy boundary.

Cg2—47 to 60 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; common medium prominent olive yellow (2.5Y 6/6) mottles; massive; hard, firm, sticky and plastic; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to more than 60 inches

Depth to carbonates: 35 to more than 60 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 or 4 (2 or 3 moist)

Chroma—0 or 1

Texture—silty clay loam, silt loam, loam, or silty clay

Btg horizon:

Hue—10YR, 2.5Y, or 5Y

Value—3 to 5 (2 to 4 moist)

Chroma—1 or 2

Texture—mainly silty clay or silty clay loam; clay loam or clay in some pedons

Cg horizon:

Hue—10YR, 2.5Y, or 5Y

Value—4 to 7 (3 to 6 moist)

Chroma—1 or 2

Texture—mainly clay, clay loam, or silty clay loam; silty clay or loam in some pedons

Playmoor Series

Depth to bedrock: Very deep

Drainage class: Poorly drained

Permeability: Moderately slow

Landform: Flood plains

Parent material: Silty alluvium

Slope: 0 to 2 percent

Typical Pedon

Playmoor silty clay loam, 1,236 feet east and 153 feet south of the northwest corner of sec. 20, T. 121 N., R. 59 W.

Az—0 to 8 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable; many fine and very fine roots; common fine nests of salts; strong effervescence; moderately alkaline; clear wavy boundary.

Bz1—8 to 16 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak coarse and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; few fine nests of gypsum; common fine nests of salts; strong effervescence; moderately alkaline; clear wavy boundary.

Bz2—16 to 25 inches; gray (10YR 5/1) silty clay loam, very dark gray (5Y 3/1) moist; weak coarse and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common fine nests of gypsum; many fine nests of salts; strong effervescence; moderately alkaline; clear wavy boundary.

Bkzg—25 to 36 inches; gray (5Y 5/1) silty clay loam, dark gray (5Y 4/1) moist; weak medium and fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common medium and fine accumulations of carbonate; common fine nests of salts; strong effervescence; moderately alkaline; clear wavy boundary.

Cg1—36 to 47 inches; gray (5Y 5/1) silty clay loam, dark gray (5Y 4/1) moist; very hard, firm, sticky and plastic; common medium and fine accumulations of carbonate; few fine nests of salts; strong effervescence; moderately alkaline; clear wavy boundary.

Cg2—47 to 57 inches; gray (5Y 5/1) silty clay loam, dark gray (5Y 4/1) moist; weak medium and fine subangular blocky structure; very hard, friable, sticky and plastic; few coarse and common medium and fine accumulations of carbonate; few fine nests of salts; strong effervescence; moderately alkaline; clear wavy boundary.

Cg3—57 to 60 inches; light olive gray (5Y 6/2) silty clay loam, olive gray (5Y 5/2) moist; common fine prominent light olive brown (2.5Y 5/6) mottles; massive; very hard, friable, sticky and plastic; few fine nests of salts; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 50 inches

Carbonates: At the surface

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 0 to 7 inches

Other features: A buried A horizon in some pedons

A horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 to 5 (2 or 3 moist)

Chroma—0 or 1

Texture—silty clay loam or silt loam

Bz horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 to 7 (2 to 4 moist)

Chroma—0 or 1

Texture—silty clay loam or silt loam

Bk horizon:

Hue—2.5Y, 5Y, or neutral

Value—4 to 7 (2 to 6 moist)

Chroma—0 or 1

Texture—silty clay loam or silt loam

Cg horizon:

Hue—2.5Y, 5Y, or neutral

Value—5 to 7 (3 to 6 moist)

Chroma—0 to 2

Texture—silty clay loam

Poinsett Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Till plains and moraines

Parent material: Silty glacial till

Slope: 0 to 9 percent

Typical Pedon

Poinsett silty clay loam, in an area of Poinsett-Waubay silty clay loams, 1 to 6 percent slopes, 755 feet east and 1,805 feet south of the northwest corner of sec. 24, T. 124 N., R. 56 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate medium granular structure; slightly hard, friable, slightly

sticky and plastic; common fine roots; neutral; abrupt smooth boundary.

Bw1—7 to 12 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and plastic; few fine roots; neutral; clear smooth boundary.

Bw2—12 to 16 inches; dark yellowish brown (10YR 4/4) silty clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and plastic; few fine roots; slightly alkaline; gradual wavy boundary.

Bk1—16 to 27 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; weak coarse and medium subangular blocky structure; hard, friable, slightly sticky and plastic; common fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Bk2—27 to 39 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and plastic; common fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C—39 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and plastic; common medium prominent yellowish brown (10YR 5/6) iron stains; slight effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches

Depth to carbonates: 14 to 30 inches

Depth to contrasting or impervious layer: 40 to more than 60 inches over loamy glacial till

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1

Texture—silty clay loam, silt loam, or clay loam

Bw horizon:

Hue—10YR or 2.5Y

Value—4 to 6 (2 to 4 moist)

Chroma—1 to 4

Texture—mainly silt loam or silty clay loam; clay loam in some pedons

Bk horizon:

Hue—10YR or 2.5Y

Value—5 to 7 (4 to 6 moist)

Chroma—2 to 4

Texture—silt loam or silty clay loam

C horizon:

Hue—2.5Y or 5Y

Value—6 or 7 (5 or 6 moist)

Chroma—1 to 4

Texture—silt loam or silty clay loam

Putney Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Moderate in the upper part, moderate to slow in the lower part

Landform: Lake plains

Parent material: Silty glaciolacustrine sediments

Slope: 0 to 4 percent

Typical Pedon

Putney silt loam, in an area of Great Bend-Putney silt loams, 0 to 2 percent slopes, 1,050 feet south and 850 feet east of the northwest corner of sec. 7, T. 124 N., R. 59 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; slightly alkaline; abrupt smooth boundary.

Bw—8 to 15 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak coarse and medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine roots; slightly alkaline; clear wavy boundary.

Bkz1—15 to 19 inches; light gray (2.5Y 7/2) silt loam, light yellowish brown (2.5Y 6/4) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many fine nests of salts; violent effervescence; moderately alkaline; clear wavy boundary.

Bkz2—19 to 25 inches; pale yellow (2.5Y 7/4) silt loam, light yellowish brown (2.5Y 6/4) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine nests of gypsum and other salts; violent effervescence; moderately alkaline; clear wavy boundary.

C1—25 to 38 inches; pale yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; strong effervescence; moderately alkaline; clear wavy boundary.

C2—38 to 60 inches; pale yellow (2.5Y 8/4) silt loam, light yellowish brown (2.5Y 6/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; varves 1 to 2 millimeters thick; common fine and medium prominent yellowish brown (10YR 5/6) iron stains; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches

Depth to carbonates: 10 to 20 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 10 to 20 inches

A horizon:

Hue—10YR

Value—4 or 5 (2 or 3 moist)

Chroma—1

Texture—silt loam or silty clay loam

Bw horizon:

Hue—10YR or 2.5Y

Value—3 to 5 (2 or 3 moist)

Chroma—1 or 2

Texture—silty clay loam or silt loam

Bk horizon:

Hue—10YR or 2.5Y

Value—6 to 8 (4 to 6 moist)

Chroma—1 to 4

Texture—silt loam or silty clay loam

C horizon:

Hue—10YR or 2.5Y

Value—6 to 8 (4 to 6 moist)

Chroma—1 to 4

Texture—silt loam or silty clay loam

Ranslo Series

Depth to bedrock: Very deep

Drainage class: Somewhat poorly drained

Permeability: Slow

Landform: Flood plains

Parent material: Clayey alluvium

Slope: 0 to 1 percent

Typical Pedon

Ranslo loam, in an area of Ranslo-Harriet loams, 2,250 feet south and 200 feet west of the northeast corner of sec. 19, T. 123 N., R. 59 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; neutral; abrupt smooth boundary.

BE—8 to 14 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; gray (10YR 5/1) silt coatings on faces of peds; weak thin platy structure and weak medium and fine blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; neutral; clear wavy boundary.

Btn—14 to 24 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate medium and fine angular blocky; very hard, firm, sticky and plastic; common very fine roots; shiny films on faces of peds; slightly alkaline; clear wavy boundary.

Btnkz—24 to 37 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to moderate medium and fine angular blocky; very hard, firm, sticky and plastic; few very fine roots; shiny films on faces of peds; common fine and few medium accumulations of carbonate; common fine nests of salt; strong effervescence; moderately alkaline; clear wavy boundary.

C1—37 to 50 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; common fine prominent yellowish brown (10YR 5/6) mottles; massive; hard, friable, slightly sticky and slightly plastic; few fine nests of salt; slight effervescence; moderately alkaline; gradual wavy boundary.

C2—50 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, light olive brown (2.5Y 5/4) moist; many fine prominent yellowish brown (10YR 5/6) and gray (10YR 6/1) mottles; massive; hard, friable, sticky and slightly plastic; common fine dark stains of manganese oxide; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 40 inches

Depth to carbonates: 14 to 30 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 14 to 40 inches

Thickness of the surface soil: 2 to 16 inches

Other features: An E or a Bkz horizon in some pedons

A horizon:

Hue—10YR

Value—4 or 5 (2 or 3 moist)

Chroma—1

Texture—loam, silt loam, or silty clay loam

Btn horizon:

Hue—10YR or 2.5Y

Value—3 to 5 (2 or 3 moist)

Chroma—1

Texture—silty clay loam, silty clay, or clay loam

Btnkz horizon:

Hue—10YR or 2.5Y

Value—4 to 7 (3 to 5 moist)

Chroma—1 or 2

Texture—silty clay loam, clay loam, silty clay, or clay

C horizon:

Hue—2.5Y or 5Y

Value—4 to 7 (3 to 6 moist)

Chroma—1 to 4

Texture—mainly silty clay, silty clay loam, or clay loam; sandy clay loam or clay in some pedons

Rauville Series

Depth to bedrock: Very deep

Drainage class: Very poorly drained

Permeability: Moderately slow

Landform: Flood plains

Parent material: Silty alluvium

Slope: 0 to 1 percent

Typical Pedon

Rauville silty clay loam, 2,080 feet north and 80 feet east of the southwest corner of sec. 13, T. 122 N., R. 53 W.

A1—0 to 10 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; strong effervescence; slightly alkaline; clear wavy boundary.

A2—10 to 18 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; common fine strong brown (7.5YR 5/8) iron stains; strong effervescence; slightly alkaline; clear wavy boundary.

A3—18 to 32 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak coarse subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; slight effervescence; slightly alkaline; clear wavy boundary.

Cg1—32 to 52 inches; gray (5Y 5/1) silt loam, dark gray (5Y 4/1) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine snail-shell fragments; strong effervescence; slightly alkaline; clear wavy boundary.

Cg2—52 to 60 inches; gray (5Y 5/1) clay loam, very

dark gray (10YR 3/1) moist; massive; hard, firm, sticky and plastic; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 42 inches

Carbonates: At the surface

Depth to contrasting or impervious layer: 40 to more than 60 inches over gravelly material

Depth to gypsum and other salts: More than 60 inches

Other features: An Ak and a Bkg horizon in some pedons

A horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 to 5 (2 or 3 moist)

Chroma—0 to 2

Texture—silty clay loam or silt loam

Cg horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—5 to 8 (2 to 6 moist)

Chroma—0 to 2

Texture—mainly silt loam, clay loam, or silty clay loam; silty clay or loam in some pedons

2C horizon (if it occurs):

Hue—2.5Y or 5Y

Value—5 to 8 (4 to 6 moist)

Chroma—1 to 4

Texture—mainly gravelly sand, gravelly sandy loam, or sandy loam; silt loam, loam, fine sandy loam, or clay loam in some pedons

Renshaw Series

Depth to bedrock: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderate in the upper part, rapid in the lower part

Landform: Outwash plains and moraines

Parent material: Loamy alluvium over glacial outwash

Slope: 0 to 25 percent

Typical Pedon

Renshaw loam, in an area of Renshaw-Fordville loams, 0 to 2 percent slopes, 50 feet north and 1,425 feet east of the southwest corner of sec. 1, T. 122 N., R. 53 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; slightly acid; abrupt smooth boundary.

Bw1—7 to 13 inches; dark grayish brown (10YR 4/2) loam, very dark gray (10YR 3/1) moist; weak

medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine roots; neutral; clear smooth boundary.

Bw2—13 to 18 inches; brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; slightly alkaline; clear smooth boundary.

2C1—18 to 25 inches; grayish brown (10YR 5/2) gravelly sand, dark grayish brown (10YR 4/2) moist; single grain; loose; about 30 percent gravel; slight effervescence; moderately alkaline; clear wavy boundary.

2C2—25 to 60 inches; pale brown (10YR 6/3) very gravelly sand, brown (10YR 5/3) moist; single grain; loose; about 40 percent gravel; slight effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 16 inches

Depth to carbonates: 14 to 20 inches

Depth to contrasting or impervious layer: 14 to 20 inches over gravelly material

Depth to gypsum and other salts: More than 60 inches

Other features: A Bk horizon in some pedons

A horizon:

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1

Texture—loam, gravelly loam, or sandy loam

Bw horizon:

Hue—10YR

Value—3 to 5 (3 or 4 moist)

Chroma—1 to 4

Texture—loam, sandy loam, sandy clay loam, or gravelly loam

2C horizon:

Hue—10YR or 2.5Y

Value—5 to 7 (4 to 6 moist)

Chroma—2 to 4

Texture—gravelly loamy sand, very gravelly loamy sand, gravelly sand, very gravelly sand, gravelly coarse sand, very gravelly coarse sand, or coarse sand

Rondell Series

Depth to bedrock: Very deep

Drainage class: Moderately well drained

Permeability: Moderate in the upper part, moderate to slow in the lower part

Landform: Lake plains

Parent material: Silty glaciolacustrine sediments

Slope: 0 to 3 percent

Typical Pedon

Rondell silt loam, in an area of Beotia-Rondell silt loams, 0 to 3 percent slopes, 2,300 feet north and 120 feet east of the southwest corner of sec. 7, T. 124 N., R. 59 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine and very fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; strong effervescence; slightly alkaline; abrupt smooth boundary.

A—7 to 12 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; strong effervescence; slightly alkaline; clear wavy boundary.

Bk1—12 to 21 inches; pale yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; violent effervescence; moderately alkaline; gradual wavy boundary.

Bk2—21 to 31 inches; pale yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; violent effervescence; moderately alkaline; clear wavy boundary.

C—31 to 60 inches; pale yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; common fine and medium prominent gray (10YR 6/1) and yellowish brown (10YR 5/6) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; varves 1 to 5 millimeters thick; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 15 inches

Depth to carbonates: 0 to 5 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR

Value—3 to 5 (2 or 3 moist)

Chroma—1 or 2

Texture—silt loam or silty clay loam

Bk horizon:

Hue—2.5Y or 5Y

Value—6 to 8 (4 to 6 moist)

Chroma—2 to 4

Texture—silt loam or silty clay loam

C horizon:

Hue—2.5Y or 5Y

Value—5 to 8 (4 to 6 moist)

Chroma—2 to 4

Texture—mainly silt loam or silty clay loam; varved very fine sand to clay in some pedons

Rusklyn Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Till plains and moraines

Parent material: Silty glacial till

Slope: 2 to 9 percent

Typical Pedon

Rusklyn silty clay loam, in an area of Poinsett-Rusklyn-Waubay silty clay loams, 1 to 6 percent slopes, 390 feet north and 1,950 feet west of the southeast corner of sec. 27, T. 124 N., R. 56 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark gray (10YR 3/1) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and plastic; common fine roots; slight effervescence; slightly alkaline; abrupt smooth boundary.

Bk1—9 to 19 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and plastic; few fine roots; common fine accumulations of carbonate; violent effervescence (about 29 percent calcium carbonate); moderately alkaline; gradual wavy boundary.

Bk2—19 to 28 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and plastic; few fine roots; few fine prominent yellowish brown (10YR 5/6) iron stains; few medium accumulations of carbonate; violent effervescence (about 26 percent calcium carbonate); moderately alkaline; gradual wavy boundary.

C1—28 to 53 inches; light yellowish brown (2.5Y 6/4) and light gray (2.5Y 7/2) silty clay loam stratified with very thin lenses of very fine sand, grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/4) moist; common fine prominent yellowish brown

(10YR 5/6) mottles; massive; hard, friable, slightly sticky and plastic; strong effervescence; strongly alkaline; clear wavy boundary.

2C2—53 to 60 inches; light brownish gray (2.5Y 6/2) and pale yellow (2.5Y 7/4) clay loam, grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/4) moist; common medium prominent yellowish brown (10YR 5/6) mottles; massive; hard, firm, sticky and plastic; about 5 percent pebbles; strong effervescence; strongly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 10 inches

Depth to carbonates: 0 to 5 inches

Depth to contrasting or impervious layer: 40 to more than 60 inches over loamy glacial till

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR

Value—3 to 5 (2 or 3 moist)

Chroma—1 or 2

Texture—silty clay loam or silt loam

Bk horizon:

Hue—10YR or 2.5Y

Value—4 to 7 (3 to 6 moist)

Chroma—2 to 4

Texture—silty clay loam or silt loam

C horizon:

Hue—10YR or 2.5Y

Value—5 to 7 (4 to 6 moist)

Chroma—2 to 4

Texture—silty clay loam or silt loam

2C horizon:

Hue—10YR or 2.5Y

Value—5 to 7 (4 to 6 moist)

Chroma—2 to 4

Texture—clay loam or loam

Ryan Series

Depth to bedrock: Very deep

Drainage class: Poorly drained

Permeability: Very slow

Landform: Flood plains

Parent material: Clayey alluvium

Slope: 0 to 1 percent

Typical Pedon

Ryan silty clay loam, in an area of Ryan-Ludden complex, 1,250 feet east and 495 feet south of the northwest corner of sec. 1, T. 122 N., R. 61 W.

Ap—0 to 5 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine subangular

blocky structure; slightly hard, friable; common fine and very fine roots; slightly alkaline; abrupt smooth boundary.

Btn—5 to 10 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; strong medium columnar structure parting to strong fine and very fine angular blocky; very hard, firm, very sticky and very plastic; common fine and very fine roots; thin continuous gray (10YR 6/1) coatings on the tops of columns; continuous shiny films on faces of peds; few fine nests of salts; slight effervescence; moderately alkaline; clear wavy boundary.

Btnz—10 to 14 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; strong medium prismatic structure parting to strong fine and very fine angular blocky; very hard, firm, very sticky and very plastic; few very fine roots; common fine nests of salts; moderately alkaline; clear wavy boundary.

Bz1—14 to 24 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium and fine subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; few fine accumulations of carbonate; common fine nests of salts; strong effervescence; moderately alkaline; clear wavy boundary.

Bz2—24 to 33 inches; gray (10YR 5/1) silty clay, dark gray (10YR 4/1) moist; moderate medium and fine subangular blocky structure; very hard, firm, very sticky and plastic; few fine accumulations of carbonate; common fine nests of salts; strong effervescence; moderately alkaline; clear wavy boundary.

Cg1—33 to 50 inches; gray (5Y 6/1) silty clay, dark gray (5Y 4/1) moist; very hard, firm, very sticky and plastic; common fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Cg2—50 to 60 inches; gray (5Y 6/1) silty clay, dark gray (5Y 4/1) moist; massive; hard, firm, very sticky and plastic; common fine accumulations of carbonate; few medium and fine nests of salts; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to more than 48 inches

Depth to carbonates: 0 to 10 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 6 to more than 60 inches

A horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 to 5 (2 or 3 moist)

Chroma—0 or 1

Texture—silty clay loam, loam, clay, or silty clay

B_{tn} horizon:

Hue—10YR, 2.5Y, or 5Y

Value—3 or 4 (2 or 3 moist)

Chroma—1 or 2

Texture—clay or silty clay

C_g horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—4 to 6 (2 to 4 moist)

Chroma—0 to 3

Texture—silty clay or clay

Sinai Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Very slow

Landform: Ice-walled lake plains

Parent material: Clayey glaciolacustrine sediments

Slope: 0 to 6 percent

Typical Pedon

Sinai silty clay, in an area of Sinai-Nutley silty clays, 0 to 2 percent slopes, 310 feet south and 740 feet west of the northeast corner of sec. 4, T. 124 N., R. 55 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, sticky and plastic; few fine roots; slightly acid; abrupt smooth boundary.

A—7 to 12 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate medium granular; hard, firm, sticky and plastic; few fine roots; slightly acid; clear smooth boundary.

Bw—12 to 23 inches; dark gray (10YR 4/1) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, very sticky and very plastic; few fine roots; shiny films on faces of peds; neutral; clear wavy boundary.

Bk1—23 to 33 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; tongues of black (10YR 2/1) between peds; strong effervescence; moderately alkaline; clear wavy boundary.

Bk2—33 to 42 inches; light gray (2.5Y 7/2) silty clay, grayish brown (2.5Y 5/2) moist; few medium prominent yellowish brown (10YR 5/6) mottles;

moderate medium prismatic structure; very hard, firm, sticky and plastic; strong effervescence; moderately alkaline; gradual wavy boundary.

C—42 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; few coarse prominent yellowish brown (10YR 5/6) mottles; few fine nests of gypsum; slight effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 25 inches

Depth to carbonates: 17 to 34 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1 or 2

Texture—silty clay, silty clay loam, clay loam, or clay

B_w horizon:

Hue—10YR or 2.5Y

Value—3 to 6 (2 to 4 moist)

Chroma—1 to 3

Texture—mainly silty clay or clay; silty clay loam in some pedons

B_k horizon:

Hue—10YR, 2.5Y, or 5Y

Value—4 to 7 (3 to 6 moist)

Chroma—1 to 6

Texture—silty clay loam or silty clay

C horizon:

Hue—10YR, 2.5Y, or 5Y

Value—4 to 7 (3 to 6 moist)

Chroma—1 to 6

Texture—mainly silty clay loam or silty clay; stratified clay loam or silt loam in some pedons

Sioux Series

Depth to bedrock: Very deep

Drainage class: Excessively drained

Permeability: Rapid

Landform: Outwash plains and moraines

Parent material: Loamy alluvium over glacial outwash

Slope: 1 to 40 percent

Typical Pedon

Sioux gravelly loam, in an area of Sioux-Renshaw complex, 15 to 40 percent slopes, 450 feet north and

125 feet west of the southeast corner of sec. 11, T. 121 N., R. 53 W.

A—0 to 6 inches; very dark gray (10YR 3/1) gravelly loam, black (10YR 2/1) moist; weak medium and fine granular structure; soft, very friable; many fine roots; about 20 percent gravel; slight effervescence; neutral; clear wavy boundary.

AC—6 to 9 inches; brown (10YR 4/3) gravelly loam, dark brown (10YR 3/3) moist; weak medium granular structure parting to single grain; soft, very friable; common fine roots; about 20 percent gravel; strong effervescence; slightly alkaline; clear wavy boundary.

C—9 to 60 inches; light yellowish brown (10YR 6/4) very gravelly sand, dark yellowish brown (10YR 4/4) moist; single grain; loose; few fine roots to a depth of 20 inches; about 45 percent gravel; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 14 inches

Depth to carbonates: 0 to 8 inches

Depth to contrasting or impervious layer: 6 to 14 inches over gravelly material

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR

Value—3 to 5 (2 or 3 moist)

Chroma—1

Texture—mainly gravelly loam, loam, or gravelly loamy sand; sandy loam, gravelly sandy loam, loam, loamy sand, loamy coarse sand, or gravelly loamy sand in some pedons

C horizon:

Hue—10YR or 2.5Y

Value—5 to 7 (4 to 6 moist)

Chroma—2 to 4

Texture—mainly gravelly sand, gravelly loamy sand, very gravelly loamy sand, or very gravelly sand; extremely gravelly sand, very gravelly coarse sand, or extremely gravelly coarse sand in some pedons

Southam Series

Depth to bedrock: Very deep

Drainage class: Very poorly drained

Permeability: Slow

Landform: Till plains

Parent material: Local clayey alluvium

Slope: 0 to 1 percent

Typical Pedon

Southam silty clay loam, 110 feet east and 2,350 feet

south of the northwest corner of sec. 31, T. 123 N., R. 56 W.

A—0 to 7 inches; very dark gray (N 3/0) silty clay loam, black (N 2/0) moist; weak medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many medium and fine roots; slight effervescence; slightly alkaline; clear smooth boundary.

Ag1—7 to 26 inches; dark gray (2.5Y 4/0) silty clay loam, very dark gray (2.5Y 3/0) moist; weak coarse subangular blocky structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; common fine roots; common fine snail-shell fragments; strong effervescence; slightly alkaline; clear wavy boundary.

Ag2—26 to 51 inches; dark gray (5Y 4/1) silty clay, very dark gray (5Y 3/1) moist; common medium distinct olive (5Y 4/3) mottles; weak coarse subangular blocky structure; hard, firm, sticky and plastic; common fine snail-shell fragments; strong effervescence; slightly alkaline; gradual wavy boundary.

Cg—51 to 60 inches; gray (5Y 5/1) silty clay, dark gray (5Y 4/1) moist; many coarse distinct olive (5Y 4/3) mottles; massive; very hard, very firm, very sticky and very plastic; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 60 inches

Depth to carbonates: 0 to 10 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 25 to 40 inches

A horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 to 5 (2 or 3 moist)

Chroma—0 to 2

Texture—silty clay loam, silty clay, clay loam, silt loam, or clay

Cg horizon:

Hue—2.5Y, 5Y, 5GY, or neutral

Value—4 to 8 (3 to 7 moist)

Chroma—0 to 2

Texture—silty clay, silty clay loam, clay loam, or clay

Tonka Series

Depth to bedrock: Very deep

Drainage class: Poorly drained

Permeability: Slow

Landform: Till plains

Parent material: Local clayey alluvium

Slope: 0 to 1 percent

Typical Pedon

Tonka silt loam, in an area of Cubden-Tonka complex, 335 feet north and 750 feet east of the southwest corner of sec. 14, T. 124 N., R. 59 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; moderate fine granular structure; soft, friable; many fine roots; neutral; abrupt smooth boundary.

A—6 to 11 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to moderate fine granular; soft, friable; common fine roots; neutral; clear smooth boundary.

E—11 to 17 inches; gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; few fine distinct yellowish brown (10YR 5/4) mottles; moderate thin platy structure parting to weak fine granular; soft, friable; common fine roots; neutral; clear wavy boundary.

Bt1—17 to 21 inches; dark gray (10YR 4/1) and gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) and dark gray (10YR 4/1) moist; few fine distinct yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to moderate fine angular blocky; very hard, firm, sticky and plastic; few fine and very fine roots; shiny films on faces of peds; neutral; clear wavy boundary.

Bt2—21 to 33 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; few fine distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; very hard, firm, sticky and plastic; few very fine roots; shiny films on faces of peds; neutral; clear wavy boundary.

Bt3—33 to 42 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; few fine prominent yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; shiny films on faces of peds; neutral; gradual wavy boundary.

Cg—42 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; common fine prominent yellowish brown (10YR 5/6) mottles; massive; hard, firm, sticky and plastic; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 50 inches

Depth to carbonates: 20 to more than 60 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: More than 60 inches

Other features: A Bk or BC horizon in some pedons

A horizon:

Hue—10YR or neutral

Value—3 or 4 (2 or 3 moist)

Chroma—0 or 1

Texture—silt loam, silty clay loam, loam, or clay loam

E horizon:

Hue—10YR, 2.5Y, or neutral

Value—5 to 7 (3 to 5 moist)

Chroma—0 to 2

Texture—loam, silt loam, very fine sandy loam, or silty clay loam

Bt horizon:

Hue—10YR, 2.5Y, or 5Y

Value—3 to 5 (2 to 4 moist)

Chroma—1 or 2

Texture—clay loam, silty clay loam, silty clay, or clay

Cg horizon:

Hue—10YR, 2.5Y, or 5Y

Value—3 to 7 (2 to 6 moist)

Chroma—1 to 6

Texture—mainly silty clay loam, clay loam, or loam; silty clay, clay, silt loam, or sandy clay loam in some pedons

Vallers Series

Depth to bedrock: Very deep

Drainage class: Poorly drained

Permeability: Moderately slow

Landform: Till plains

Parent material: Loamy glacial till

Slope: 0 to 3 percent

Typical Pedon

Vallers loam, in an area of Vallers-Hamerly loams, 300 feet east and 320 feet north of the southwest corner of sec. 18, T. 122 N., R. 57 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to moderate medium granular; hard, friable, slightly sticky and slightly plastic; common fine roots; about 3 percent pebbles; strong effervescence; slightly alkaline; clear smooth boundary.

A—6 to 11 inches; gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure parting to moderate medium granular; hard, friable, slightly sticky and slightly plastic; common fine roots; about 3 percent

pebbles; violent effervescence; slightly alkaline; clear wavy boundary.

Bkg—11 to 18 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; few fine prominent yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; about 5 percent pebbles; violent effervescence; moderately alkaline; clear wavy boundary.

Czg—18 to 46 inches; pale olive (5Y 6/3) clay loam, olive (5Y 5/3) moist; common medium prominent yellowish brown (10YR 5/6) mottles; massive; hard, friable, sticky and plastic; common fine nests of gypsum and other salts; about 5 percent pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

Cg—46 to 60 inches; pale olive (5Y 6/3) clay loam, olive (5Y 4/3) moist; common medium prominent yellowish brown (10YR 5/6) mottles; massive; hard, firm, sticky and plastic; few fine nests of gypsum; about 5 percent pebbles; slight effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 25 inches

Depth to carbonates: 0 to 10 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 0 to more than 60 inches

A horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 or 4 (2 or 3 moist)

Chroma—0 or 1

Texture—clay loam, silt loam, loam, sandy clay loam, or silty clay loam

Bkg horizon:

Hue—10YR, 2.5Y, 5Y, or neutral

Value—4 to 7 (3 to 6 moist)

Chroma—0 to 2

Texture—clay loam, silty clay loam, loam, or sandy clay loam

Cg horizon:

Hue—2.5Y or 5Y

Value—5 to 8 (4 to 7 moist)

Chroma—1 to 3

Texture—loam or clay loam

Vienna Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Till plains

Parent material: Loess over loamy glacial till

Slope: 0 to 6 percent

Typical Pedon

Vienna silt loam, in an area of Vienna-Brookings complex, 1 to 6 percent slopes, 2,540 feet south and 150 feet west of the northeast corner of sec. 35, T. 122 N., R. 53 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; slightly acid; abrupt smooth boundary.

Bw1—8 to 14 inches; brown (10YR 4/3) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; neutral; gradual wavy boundary.

Bw2—14 to 17 inches; yellowish brown (10YR 5/4) silty clay loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; neutral; abrupt wavy boundary.

2Bw3—17 to 23 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; about 5 percent pebbles; neutral; abrupt wavy boundary.

2Bk—23 to 35 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; moderate coarse subangular blocky structure; hard, friable, sticky and plastic; common medium accumulations of carbonate; about 5 percent pebbles; violent effervescence; slightly alkaline; gradual wavy boundary.

2C—35 to 60 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, sticky and plastic; about 5 percent pebbles; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 16 inches

Depth to carbonates: 14 to 30 inches

Depth to contrasting or impervious layer: 10 to 20 inches over loamy glacial till

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1 or 2

Texture—silt loam, silty clay loam, or loam

Bw horizon:

Hue—10YR or 2.5Y

Value—3 to 5 (2 to 4 moist)

Chroma—1 to 4

Texture—mainly silt loam or silty clay loam; clay loam or loam in some pedons

2Bw horizon:

Hue—10YR or 2.5Y

Value—3 to 5 (2 to 4 moist)

Chroma—1 to 4

Texture—loam or clay loam

2Bk horizon:

Hue—10YR or 2.5Y

Value—6 or 7 (4 or 5 moist)

Chroma—3 or 4

Texture—loam or clay loam

2C horizon:

Hue—10YR or 2.5Y

Value—6 or 7 (5 or 6 moist)

Chroma—2 to 4

Texture—loam or clay loam

Waubay Series

Depth to bedrock: Very deep

Drainage class: Moderately well drained

Permeability: Moderate

Landform: Till plains

Parent material: Silty glacial till

Slope: 0 to 2 percent

Typical Pedon

Waubay silty clay loam, in an area of Poinsett-Waubay silty clay loams, 0 to 2 percent slopes, 780 feet north and 2,415 feet west of the southeast corner of sec. 19, T. 122 N., R. 56 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; neutral; abrupt smooth boundary.

A—8 to 12 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate medium granular; hard, friable, slightly sticky and slightly plastic; few fine roots; neutral; clear smooth boundary.

Bw1—12 to 19 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to

moderate medium subangular blocky; hard, friable, slightly sticky and plastic; few fine roots; few patchy shiny films on faces of peds; neutral; clear smooth boundary.

Bw2—19 to 23 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and plastic; few very fine roots; slightly alkaline; clear smooth boundary.

Bk—23 to 36 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; moderate medium and fine subangular blocky structure; hard, friable, slightly sticky and plastic; few very fine roots; few fine accumulations of carbonate; violent effervescence; moderately alkaline; clear wavy boundary.

C—36 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; massive; hard, friable, slightly sticky and plastic; many coarse prominent strong brown (7.5YR 5/6) iron stains; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 35 inches

Depth to carbonates: 20 to 36 inches

Depth to contrasting or impervious layer: 40 to more than 60 inches over loamy glacial till

Depth to gypsum and other salts: More than 60 inches

A horizon:

Hue—10YR

Value—3 or 4 (2 or 3 moist)

Chroma—1

Texture—silty clay loam or silt loam

Bw horizon:

Hue—10YR or 2.5Y

Value—3 to 5 (3 or 4 moist)

Chroma—1 to 3

Texture—silt loam or silty clay loam

Bk horizon:

Hue—2.5Y

Value—5 or 6 (4 or 5 moist)

Chroma—2 to 4

Texture—silt loam or silty clay loam

C horizon:

Hue—2.5Y or 5Y

Value—5 to 7 (4 to 6 moist)

Chroma—2 to 4

Texture—mainly silt loam, silty clay loam, or loam; very fine sandy loam, fine sand, or clay in some pedons

Zell Series

Depth to bedrock: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Lake plains

Parent material: Silty glaciolacustrine sediments

Slope: 2 to 9 percent

Typical Pedon

Zell silt loam, in an area of Great Bend-Zell-Huffton silt loams, 4 to 9 percent slopes, 2,385 feet south and 335 feet west of the northeast corner of sec. 6, T. 124 N., R. 59 W.

A—0 to 7 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; strong effervescence; moderately alkaline; abrupt smooth boundary.

Bk1—7 to 12 inches; light gray (2.5Y 7/2) silt loam, olive brown (2.5Y 4/4) moist; weak coarse and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; few fine accumulations of carbonate; violent effervescence; moderately alkaline; clear wavy boundary.

Bk2—12 to 23 inches; light gray (2.5Y 7/2) silt loam, light olive brown (2.5Y 5/4) moist; weak coarse and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; few fine accumulations of carbonate; violent effervescence; moderately alkaline; clear wavy boundary.

C1—23 to 31 inches; pale yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; varves 1 to 2 millimeters thick; common fine prominent yellowish brown (10YR 5/6) iron stains; strong effervescence; moderately alkaline; clear wavy boundary.

C2—31 to 50 inches; light brownish gray (2.5Y 6/2) very fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; varves 1 to 2 millimeters thick; strong effervescence; moderately alkaline; clear wavy boundary.

C3—50 to 60 inches; light gray (2.5Y 7/2) silt loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; varves 1 to 2 millimeters thick; common fine prominent yellowish brown (10YR 5/6) iron stains; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches

Depth to carbonates: 0 to 4 inches

Depth to contrasting or impervious layer: More than 60 inches

Depth to gypsum and other salts: 20 to more than 60 inches

A horizon:

Hue—10YR

Value—3 to 5 (2 or 3 moist)

Chroma—1

Texture—silt loam, very fine sandy loam, fine sandy loam, or loam

Bk horizon:

Hue—10YR or 2.5Y

Value—5 to 8 (3 to 6 moist)

Chroma—2 to 4

Texture—silt loam or very fine sandy loam

C horizon:

Hue—10YR or 2.5Y

Value—6 to 8 (4 to 6 moist)

Chroma—2 to 4

Texture—mainly silt loam, loam, or very fine sandy loam; varved very fine sand to clay in some pedons

Formation of the Soils

Soil forms when chemical and physical processes act on geologically deposited or accumulated material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the plant and animal life on and in the soil, the relief, and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life are active factors of soil formation. They act on the parent material and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are modified by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil having genetically related horizons. Generally, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. The following paragraphs relate the factors of soil formation to the soils in Day County.

Climate

Climate directly influences the rate of chemical and physical weathering. Day County has a continental climate marked by cold winters and hot summers. This climate favors the growth of grasses and the resulting accumulation of organic matter in the upper part of the soil profile. The precipitation is sufficient to leach carbonates in most soils to a depth of about 18 inches. The climate in the eastern part of the county is somewhat wetter than that in the western part, and thus it has become a factor in differentiating some of the soils within the county.

Plant and Animal Life

Plants, animals, insects, earthworms, bacteria, and fungi have an important effect on soil formation. They

cause gains in organic matter, gains or losses in plant nutrients, and changes in soil structure and porosity. In Day County the tall and mid prairie grasses have had more influence than other living organisms on soil formation. As a result of these grasses, the surface layer of many of the soils, including those of the Aastad series, has a moderate or high content of organic matter.

Earthworms, insects, and burrowing animals help to keep the soil open and porous. Bacteria, actinomycetes, and fungi decompose plant residue, thus releasing nutrients for other plants.

Parent Material

Parent material is the unconsolidated organic and mineral material in which a soil forms. It determines many of the chemical and physical characteristics of the soil, such as color, texture, reaction, and consistence. The rate of soil formation is more rapid in the more friable, loamy and silty parent material than in other kinds of parent material. Also, more changes take place in this kind of parent material and the soils develop more distinct horizons.

Most of the soils in Day County formed in glacial material derived from pre-glacial formations of granite, gneiss, limestone, sandstone, and shale. The glacier ground up and mixed these materials as it transported them. It then redeposited them as it melted. Some deposits consist of material that was sorted either by wind or by water after it was deposited. Other deposits consist of unsorted material, or glacial till.

The glacial till in Day County can generally be classified as loamy glacial till or silty glacial till. The silty glacial till is in scattered areas throughout the central part of the county from north to south. The loamy glacial till is mainly in the western part of the county, in the area of the Bristol and Crandall Hills. It is also intermixed with areas of silty glacial till. The loamy glacial till generally has scattered stones and boulders throughout.

The silty glacial till was deposited on glacial ice and then reworked by water as the glacier melted. Poinsett and Waubay soils formed in silty glacial till. Loamy

glacial till is a mixture of clay, silt, sand, and gravel and few to many stones and boulders. It has a higher content of stones and boulders than the silty glacial till. Barnes, Forman, and Buse soils formed in loamy glacial till.

Glacial outwash is sandy, gravelly, and loamy material deposited by glacial meltwater. Fordville and Renshaw soils formed in loamy material underlain by sand and gravel within a depth of 40 inches. Most of the soils that formed in glacial outwash are in the east-central part of the county, near the larger lakes. Soils that formed in outwash sediments are also along the Coteau des Prairies escarpment in the western part of the county.

Soils in the extreme northwest corner of the county formed in parent materials deposited by Glacial Lake Dakota. Parent material in this area is characterized by varved silts and clays that were deposited on the bottom of the ancient glacial lake. Aberdeen, Beotia, and Great Bend soils formed in this material.

The western one-third of the county is dominated by a nearly level area of soils that formed in a thin mantle of loess over loamy glacial till. The silty loess was probably derived from the lacustrine deposits to the west. Kranzburg and Brookings soils formed in this material.

Alluvium is recently deposited, sandy to clayey material on flood plains and in basins. Lamoure, La Prairie, and Rauville soils formed in stream-deposited alluvium. Parnell, Southam, and Tonka soils are examples of soils that formed in local alluvium in basins on uplands.

Relief

Relief influences soil formation through its effect on drainage, runoff, erosion, plant cover, and soil temperature. On the more sloping soils, such as Buse

soils, much of the rainfall is lost through runoff. As a result of excessive runoff, a limited amount of moisture penetrates the surface and much of the soil material is lost through erosion. These soils have a thin surface layer and a low content of organic matter. Runoff is slower on Forman, Poinsett, and other less sloping soils, and more moisture penetrates the surface. These soils are calcareous at a greater depth than the Buse soils. Also, they have thicker horizons in which organic matter has accumulated.

Oldham, Parnell, Southam, and Tonka soils are in basins where water ponds. These soils have the colors characteristic of poorly drained soils. Aastad and Waubay soils, which are on foot slopes, receive extra moisture in the form of runoff from adjacent soils. The layers in which organic matter accumulates are thicker than those in the slightly higher, adjacent Forman and Poinsett soils. In low areas, where drainage is impeded, a fluctuating water table favors the concentration of salts in some soils. Colvin soils are examples.

Time

The length of time that the soil material has been exposed to the other four factors of soil formation is reflected in the kinds of soil that form. Generally, the degree of profile development reflects the age of a soil. The oldest soils are on the parts of the landscape that have been stable for the longest time. These are Forman and Poinsett soils, which have developed distinct horizons. The youngest soils either are those in which natural erosion removes nearly as much soil material as is formed through the weathering of parent material or are alluvial soils, which receive new material each time the area is flooded. Buse soils are examples of young soils that are subject to natural erosion. Lamoure and La Prairie soils are examples of young alluvial soils.

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Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High.....	9 to 12
Very high	more than 12

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillslopes. Back slopes are commonly steep and linear and descend to a foot slope. Back slopes are erosional forms produced mainly by mass wasting and running water.

Basin. A depressed area with no surface outlet. Examples are closed depressions in a glacial till plain or lake basin.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles 2 millimeters to 38 centimeters (15 inches) long.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour farming. Growing crops in strips that follow the contour.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. The thickness of weathered soil material over bedrock. The depth classes in this survey are as follows:

Very deep	more than 60 inches
Deep	40 to 60 inches
Moderately deep	20 to 40 inches
Shallow	less than 20 inches

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious.

Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly

continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess salt (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest

bulk density and the highest water content at saturation of all organic soil material.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Ice-walled lake plain. A lake plain that was surrounded by stagnant ice. The sediment is very fine sand, silt, and clay and is commonly laminated. These lake plains were formed on solid ground, not on ice.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and are less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landform. Any physical, recognizable form or feature of the earth's surface having a characteristic shape and produced by natural causes.

Landscape. All the natural features, such as fields, hills, forests, and water, that distinguish one part of the earth's surface from another.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by the wind.

Low strength. The soil is not strong enough to support loads.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include part of the subsoil.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to adversely affect the physical condition of the subsoil.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse

textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Pasture, tame. Grazingland that has been planted primarily with introduced or domesticated native forage species and that receives periodic renovation or cultural treatment, such as tillage, fertilization, mowing, weed control, and irrigation.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile.

Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipeline cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Profile, soil. A vertical section of the soil extending

through all its horizons and into the parent material.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does

not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder slope. The uppermost inclined surface at the top of a hillslope; a transition zone from the back slope to the summit of an upland. It is dominantly convex in profile and erosional in origin.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. The slope classes in this survey are as follows:

Level	0 to 1 percent
Nearly level	0 to 3 percent
Gently sloping or undulating	2 to 6 percent
Moderately sloping or gently rolling	6 to 9 percent

Strongly sloping or rolling	9 to 15 percent
Moderately steep or hilly	15 to 25 percent
Steep or very hilly	25 to 45 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy*

(laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The top or highest level of an upland feature. A high interfluvial area of gentler slope that is flanked by steeper hillslopes.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress

roadbanks, lawns, and land affected by mining.

Transitional layer. A layer of soil that grades to the next layer or includes parts of adjacent layers, commonly between the surface layer and the subsoil or the underlying material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace;

land above the lowlands along streams.

Varve. A sedimentary layer of a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1952-87 at Webster, South Dakota)

	Temperature						Precipitation				
Month	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have--		Average number of growing degree days*	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
	<u>° F</u>	<u>° F</u>	<u>° F</u>	<u>° F</u>	<u>° F</u>	<u>Units</u>	<u>In</u>	<u>In</u>	<u>In</u>		<u>In</u>
January-----	19.3	-1.3	9.0	45	-32	0	0.60	0.14	0.92	2	6.7
February-----	25.8	5.7	15.8	51	-27	0	.62	.21	.94	2	6.3
March-----	38.2	17.8	28.0	68	-17	16	.98	.36	1.42	3	7.3
April-----	55.7	32.0	43.9	85	8	49	2.07	.79	3.05	5	1.8
May-----	69.0	43.7	56.4	89	23	234	2.79	1.19	3.98	6	.2
June-----	77.7	53.5	65.6	95	37	468	3.57	2.00	4.81	7	.0
July-----	84.7	59.0	71.9	100	43	679	2.96	1.11	4.31	6	.0
August-----	83.2	56.9	70.1	99	41	623	2.78	1.23	3.87	5	.0
September---	71.8	45.7	58.8	94	26	274	1.82	.47	2.84	4	.1
October-----	59.0	35.0	47.0	83	14	68	1.46	.36	2.27	3	.2
November----	39.4	19.8	29.6	68	-9	0	.84	.20	1.28	3	4.9
December----	25.1	5.9	15.5	49	-26	0	.60	.17	.93	2	5.2
Yearly:											
Average---	54.1	31.3	42.6	---	---	---	---	---	---	---	---
Extreme---	---	---	---	101	-33	---	---	---	---	---	---
Total-----	---	---	---	---	---	2,411	21.09	15.86	25.73	48	32.7

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL
(Recorded in the period 1952-87 at Webster, South Dakota)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 8	May 16	May 16
2 years in 10 later than--	May 2	May 11	May 12
5 years in 10 later than--	Apr. 21	May 1	May 5
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 30	Sept. 18	Sept. 17
2 years in 10 earlier than--	Oct. 4	Sept. 23	Sept. 20
5 years in 10 earlier than--	Oct. 11	Oct. 1	Sept. 25

TABLE 3.--GROWING SEASON
(Recorded in the period 1952-87 at Webster, South
Dakota)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	<u>Days</u>	<u>Days</u>	<u>Days</u>
9 years in 10	153	135	125
8 years in 10	159	141	131
5 years in 10	172	153	142
2 years in 10	185	164	153
1 year in 10	192	171	159

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Aa	Aastad loam-----	980	0.1
An	Aberdeen-Nahon silty clay loams-----	568	0.1
Aq	Aquents, saline-----	173	*
ArB	Arvilla sandy loam, 2 to 6 percent slopes-----	367	0.1
Ba	Bearden silt loam-----	10	*
BaB	Bearden-Huffton silt loams, 1 to 6 percent slopes-----	15	*
BbA	Beotia silt loam, 0 to 2 percent slopes-----	5	*
Bc	Beotia-Rondell silt loams, 0 to 3 percent slopes-----	535	0.1
BnD	Buse-Barnes loams, 9 to 20 percent slopes-----	48,599	7.0
BoE	Buse-Barnes loams, 9 to 40 percent slopes, very stony-----	6,824	1.0
BpE	Buse-Barnes-Parnell complex, 0 to 25 percent slopes, stony-----	2,248	0.3
BrE	Buse-Langhei complex, 15 to 40 percent slopes-----	4,669	0.7
BsE	Buse-La Prairie, channeled-Barnes loams, 0 to 40 percent slopes-----	2,080	0.3
BxE	Buse-Sioux complex, 9 to 40 percent slopes-----	4,353	0.6
Ca	Cavour-Ferney loams-----	1,054	0.2
Cn	Colvin silty clay loam-----	1,810	0.3
Cr	Cresbard-Cavour loams-----	1,294	0.2
Cu	Cubden silty clay loam-----	2,529	0.4
Cw	Cubden-Badger silty clay loams-----	487	0.1
Cx	Cubden-Tonka complex-----	2,271	0.3
Dd	Divide loam-----	2,370	0.3
Do	Dovray silty clay-----	562	0.1
EaA	Eckman very fine sandy loam, 0 to 2 percent slopes-----	46	*
EbB	Eckman-Gardena very fine sandy loams, 2 to 6 percent slopes-----	10	*
EcB	Eckman-Zell very fine sandy loams, 1 to 6 percent slopes-----	10	*
EdC	Edgeley loam, 4 to 9 percent slopes-----	257	*
EgB	Egeland-Embsen complex, 2 to 6 percent slopes-----	1,787	0.3
En	Exline-Aberdeen-Nahon silt loams-----	1,015	0.1
Ep	Exline-Putney silt loams, 1 to 4 percent slopes-----	1,072	0.2
Fd	Fordville loam, 0 to 2 percent slopes-----	3,460	0.5
FmA	Forman-Aastad loams, 0 to 3 percent slopes-----	7,603	1.1
FmB	Forman-Aastad loams, 1 to 6 percent slopes-----	13,520	1.9
FnB	Forman-Aastad-Parnell complex, 0 to 6 percent slopes-----	1,284	0.2
FoB	Forman-Buse-Aastad loams, 1 to 6 percent slopes-----	124,473	17.7
FoC	Forman-Buse-Aastad loams, 2 to 9 percent slopes-----	104,671	15.0
FpB	Forman-Buse-Parnell complex, 0 to 6 percent slopes-----	3,821	0.5
FpC	Forman-Buse-Parnell complex, 0 to 9 percent slopes-----	5,261	0.8
Gb	Great Bend silt loam, 0 to 2 percent slopes-----	984	0.1
Gp	Great Bend-Putney silt loams, 0 to 2 percent slopes-----	398	0.1
GzC	Great Bend-Zell-Huffton silt loams, 4 to 9 percent slopes-----	390	0.1
HaA	Hamerly loam, 0 to 2 percent slopes-----	3,941	0.6
HaB	Hamerly loam, 2 to 6 percent slopes-----	6,188	0.9
Hb	Hamerly-Parnell complex-----	7,589	1.1
Hd	Harmony-Aberdeen silty clay loams-----	1,275	0.2
Hm	Harmony-Beotia silt loams-----	705	0.1
Hr	Harriet loam-----	554	0.1
HtA	Hetland silty clay loam, 0 to 2 percent slopes-----	1,168	0.2
HuB	Hetland-Rusklyn silty clay loams, 2 to 6 percent slopes-----	1,894	0.3
KbE	Kloten-Buse complex, 9 to 40 percent slopes-----	737	0.1
KrB	Kranzburg-Brookings-Buse complex, 1 to 6 percent slopes-----	15,209	2.2
Ks	Kranzburg-Brookings silt loams, 0 to 2 percent slopes-----	32,791	4.7
KtB	Kranzburg-Forman complex, 2 to 6 percent slopes-----	18,493	2.6
La	La Prairie loam-----	1,484	0.2
Lh	La Prairie-Holmquist loams, channeled-----	4,849	0.7
Lm	Lamoure silty clay loam-----	1,419	0.2
Lo	Lowe loam-----	50	*
Lu	Ludden silty clay-----	1,453	0.2
Lw	Ludden silty clay, ponded-----	200	*
Lx	Ludden-Ludden, saline, silty clays-----	200	*
MaA	Maddock-Egeland sandy loams, 0 to 2 percent slopes-----	445	0.1
MaB	Maddock-Egeland sandy loams, 2 to 6 percent slopes-----	2,519	0.4
MaC	Maddock-Egeland sandy loams, 6 to 12 percent slopes-----	1,336	0.2

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
Md	Marysland-Divide loams-----	1,732	0.2
MfB	Mauvais clay loam, 2 to 6 percent slopes-----	2,028	0.3
MgB	Mauvais clay loam, 2 to 6 percent slopes, stony-----	1,283	0.2
MnA	Minnewasta sandy loam, 0 to 2 percent slopes-----	2,638	0.4
MoB	Minnewasta sandy loam, 2 to 6 percent slopes, stony-----	255	*
Mw	Minnewaukan loamy sand-----	456	0.1
Na	Nahon-Aberdeen-Exline silt loams-----	4,894	0.7
NsB	Nutley-Sinai silty clays, 2 to 6 percent slopes-----	5,514	0.8
Oh	Oldham silty clay loam-----	20,337	2.9
Or	Orthents, gravelly-----	1,409	0.2
Pa	Parnell silty clay loam-----	17,701	2.5
Pc	Playmoor silty clay loam-----	2,518	0.4
Pm	Playmoor-Lamoure silty clay loams, channeled-----	170	*
PrC	Poinsett-Rusklyn silty clay loams, 6 to 9 percent slopes-----	2,144	0.3
PsB	Poinsett-Rusklyn-Waubay silty clay loams, 1 to 6 percent slopes-----	19,535	2.8
PwA	Poinsett-Waubay silty clay loams, 0 to 2 percent slopes-----	5,647	0.8
PwB	Poinsett-Waubay silty clay loams, 1 to 6 percent slopes-----	14,224	2.0
Ra	Ranslo-Harriet loams-----	652	0.1
Rb	Rauville silty clay loam-----	1,677	0.2
RfA	Renshaw-Fordville loams, 0 to 2 percent slopes-----	5,713	0.8
RfB	Renshaw-Fordville loams, 2 to 6 percent slopes-----	10,815	1.5
RsA	Renshaw-Sioux loams, 0 to 2 percent slopes-----	349	*
Rsb	Renshaw-Sioux complex, 2 to 9 percent slopes-----	22,267	3.2
Ru	Ryan-Ludden complex-----	25	*
SaA	Sinai-Nutley silty clays, 0 to 2 percent slopes-----	1,441	0.2
SbB	Sioux gravelly loamy sand, 2 to 6 percent slopes-----	3,390	0.5
SoB	Sioux gravelly loamy sand, 2 to 6 percent slopes, very stony-----	826	0.1
SrD	Sioux-Renshaw complex, 9 to 15 percent slopes-----	7,680	1.1
SrE	Sioux-Renshaw complex, 15 to 40 percent slopes-----	782	0.1
SsE	Sioux-Renshaw complex, 9 to 40 percent slopes, very stony-----	1,253	0.2
Sw	Southam silty clay loam-----	43,690	6.3
To	Tonka silt loam-----	2,105	0.3
Va	Vallers loam, saline-----	1,506	0.2
Vh	Vallers-Hamerly loams-----	6,418	0.9
VoA	Vienna-Brookings complex, 0 to 2 percent slopes-----	527	0.1
VoB	Vienna-Brookings complex, 1 to 6 percent slopes-----	2,239	0.3
	Water-----	23,991	3.4
	Total-----	698,195	100.0

* Less than 0.05 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
Aa	Aastad loam
Ba	Bearden silt loam
BbA	Beotia silt loam, 0 to 2 percent slopes
Bc	Beotia-Rondell silt loams, 0 to 3 percent slopes
Cn	Colvin silty clay loam (where drained)
Cu	Cubden silty clay loam
Cw	Cubden-Badger silty clay loams (where drained)
Cx	Cubden-Tonka complex (where drained)
Dd	Divide loam
EaA	Eckman very fine sandy loam, 0 to 2 percent slopes
EbB	Eckman-Gardena very fine sandy loams, 2 to 6 percent slopes
EcB	Eckman-Zell very fine sandy loams, 1 to 6 percent slopes
EgB	Egeland-Embsen complex, 2 to 6 percent slopes
Fd	Fordville loam, 0 to 2 percent slopes
FmA	Forman-Aastad loams, 0 to 3 percent slopes
FmB	Forman-Aastad loams, 1 to 6 percent slopes
FnB	Forman-Aastad-Parnell complex, 0 to 6 percent slopes
FoB	Forman-Buse-Aastad loams, 1 to 6 percent slopes
FpB	Forman-Buse-Parnell complex, 0 to 6 percent slopes
Gb	Great Bend silt loam, 0 to 2 percent slopes
Gp	Great Bend-Putney silt loams, 0 to 2 percent slopes
HaA	Hamerly loam, 0 to 2 percent slopes
HaB	Hamerly loam, 2 to 6 percent slopes
Hm	Harmony-Beotia silt loams
HtA	Hetland silty clay loam, 0 to 2 percent slopes
HuB	Hetland-Rusklyn silty clay loams, 2 to 6 percent slopes
KrB	Kranzburg-Brookings-Buse complex, 1 to 6 percent slopes
Ks	Kranzburg-Brookings silt loams, 0 to 2 percent slopes
KtB	Kranzburg-Forman complex, 2 to 6 percent slopes
La	La Prairie loam
Lm	Lamoure silty clay loam (where drained)
Lo	Lowe loam (where drained)
Lu	Ludden silty clay (where drained)
MaA	Maddock-Egeland sandy loams, 0 to 2 percent slopes (where irrigated)
MaB	Maddock-Egeland sandy loams, 2 to 6 percent slopes (where irrigated)
Md	Marysland-Divide loams (where drained)
NsB	Nutley-Sinai silty clays, 2 to 6 percent slopes
PsB	Poinsett-Rusklyn-Waubay silty clay loams, 1 to 6 percent slopes
PwA	Poinsett-Waubay silty clay loams, 0 to 2 percent slopes
PwB	Poinsett-Waubay silty clay loams, 1 to 6 percent slopes
RfA	Renshaw-Fordville loams, 0 to 2 percent slopes (where irrigated)
RfB	Renshaw-Fordville loams, 2 to 6 percent slopes (where irrigated)
SaA	Sinai-Nutley silty clays, 0 to 2 percent slopes
To	Tonka silt loam (where drained)
Vh	Vallers-Hamerly loams (where drained)
VoA	Vienna-Brookings complex, 0 to 2 percent slopes
VoB	Vienna-Brookings complex, 1 to 6 percent slopes

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Corn	Oats	Spring wheat	Soybeans	Barley	Alfalfa hay	Bromegrass- alfalfa
	Bu	Bu	Bu	Bu	Bu	Tons	AUM*
Aa----- Aastad	79	72	39	30	58	3.1	3.1
An----- Aberdeen-Nahon	53	48	27	20	40	2.0	2.1
Aq----- Aquents	2	1	1	---	2	---	0.2
ArB----- Arvilla	17	26	15	7	23	1.4	1.4
Ba----- Bearden	74	52	29	23	42	2.3	2.7
BaB----- Bearden-Huffton	62	48	27	19	39	2.1	2.4
BbA----- Beotia	89	73	41	33	58	3.3	3.3
Bc----- Beotia-Rondell	84	67	38	30	54	3.0	3.0
BnD----- Buse-Barnes	33	36	20	12	29	1.8	1.8
BoE. Buse-Barnes							
BpE----- Buse-Barnes-Parnell	5	1	1	2	1	---	0.1
BrE----- Buse-Langhei	11	14	8	4	12	1.1	1.2
BsE----- Buse-La Prairie-Barnes	20	20	11	7	17	1.2	1.5
BxE----- Buse-Sioux	10	13	8	4	12	1.0	1.0
Ca----- Cavour-Ferney	19	21	12	7	19	0.8	1.0
Cn----- Colvin	47	27	15	15	22	0.5	2.3
Cr----- Cresbard-Cavour	47	42	24	17	35	1.8	1.9
Cu----- Cubden	69	54	30	22	44	2.2	2.5
Cw----- Cubden-Badger	69	54	29	24	44	1.9	2.6

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Spring wheat	Soybeans	Barley	Alfalfa hay	Bromegrass- alfalfa
	<u>Bu</u>	<u>Bu</u>	<u>Bu</u>	<u>Bu</u>	<u>Bu</u>	<u>Tons</u>	<u>AUM*</u>
Cx----- Cubden-Tonka	64	39	22	22	32	1.5	2.1
Dd----- Divide	58	48	27	19	40	1.9	2.4
Do----- Dovray	26	7	4	10	5	---	0.4
EaA----- Eckman	83	70	39	31	55	2.9	3.0
EbB----- Eckman-Gardena	79	66	37	30	53	2.9	3.0
EcB----- Eckman-Zell	72	61	34	26	49	2.6	2.7
EdC----- Edgeley	48	44	25	18	37	2.0	2.1
EgB----- Egeland-Embden	48	49	27	18	41	2.1	2.2
En----- Exline-Aberdeen-Nahon	32	29	17	12	25	1.2	1.3
Ep----- Exline-Putney	39	34	19	14	29	1.5	1.6
Fd----- Fordville	44	49	27	17	41	1.9	2.0
FmA----- Forman-Aastad	74	69	37	28	55	2.8	2.8
FmB----- Forman-Aastad	70	65	35	26	52	2.7	2.7
FnB----- Forman-Aastad-Parnell	60	52	29	23	42	2.1	2.2
FoB----- Forman-Buse-Aastad	64	60	33	23	49	2.5	2.5
FoC----- Forman-Buse-Aastad	54	53	29	20	43	2.2	2.3
FpB----- Forman-Buse-Parnell	52	47	26	19	38	1.8	1.9
FpC----- Forman-Buse-Parnell	44	40	22	16	33	1.6	1.8
Gb----- Great Bend	86	70	39	32	56	3.0	3.1
Gp----- Great Bend-Putney	83	68	38	30	55	2.9	3.0

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Spring wheat	Soybeans	Barley	Alfalfa hay	Bromegrass- alfalfa
	Bu	Bu	Bu	Bu	Bu	Tons	AUM*
GzC----- Great Bend-Zell-Huffton	54	49	27	19	39	2.2	2.4
HaA----- Hamerly	66	52	29	21	42	2.1	2.5
HaB----- Hamerly	60	49	28	19	41	2.0	2.4
Hb----- Hamerly-Parnell	48	32	18	16	26	1.2	1.5
Hd----- Harmony-Aberdeen	75	63	35	28	51	2.7	2.8
Hm----- Harmony-Beotia	84	69	38	31	55	3.0	3.1
Hr----- Harriet	5	1	1	1	2	---	0.2
HtA----- Hetland	75	69	38	28	56	2.6	2.7
HuB----- Hetland-Rusklyn	62	59	33	23	48	2.4	2.5
KbE----- Kloten-Buse	8	11	6	3	9	0.9	1.0
KrB----- Kranzburg-Brookings-Buse	76	64	35	28	51	2.9	3.0
Ks----- Kranzburg-Brookings	85	69	38	32	55	3.1	3.2
KtB----- Kranzburg-Forman	68	64	35	26	51	2.5	2.6
La----- La Prairie	85	69	38	32	55	3.0	3.2
Lh----- La Prairie-Holmquist	21	11	6	7	10	0.7	1.6
Lm----- Lamoure	64	44	25	20	35	1.1	2.9
Lo----- Lowe	50	26	15	16	21	0.5	2.4
Lu----- Ludden	46	20	11	16	17	0.3	1.3
Lw----- Ludden	5	1	1	1	1	---	0.1
Lx----- Ludden-Ludden, saline	37	15	9	12	13	0.2	1.3

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Spring wheat	Soybeans	Barley	Alfalfa hay	Brome-grass- alfalfa
	Bu	Bu	Bu	Bu	Bu	Tons	AUM*
MaA----- Maddock-Egeland	46	47	26	18	40	2.0	2.2
MaB----- Maddock-Egeland	43	44	25	16	38	1.9	2.0
MaC----- Maddock-Egeland	33	37	21	13	32	1.8	1.9
Md----- Marysland-Divide	47	33	19	15	28	1.0	2.2
MfB----- Mauvais	48	35	19	15	29	0.7	2.1
MgB. Mauvais							
MnA----- Minnewasta	31	22	12	12	18	0.3	2.1
MoB. Minnewasta							
Mw----- Minnewaukan	36	34	19	14	28	1.3	1.6
Na----- Nahon-Aberdeen-Exline	37	35	20	13	30	1.4	1.6
NsB----- Nutley-Sinai	56	53	29	20	43	2.2	2.3
Oh----- Oldham	25	6	4	8	6	---	0.4
Or----- Orthents	4	11	6	2	10	0.7	0.8
Pa----- Parnell	25	7	4	9	6	---	0.4
Pc----- Playmoor	26	10	6	7	10	0.1	1.1
Pm----- Playmoor-Lamoure	23	7	5	7	7	0.2	1.4
PrC----- Poinsett-Rusklyn	57	55	30	21	45	2.3	2.4
PsB----- Poinsett-Rusklyn-Waubay	69	65	36	25	52	2.6	2.7
PwA----- Poinsett-Waubay	82	75	41	31	60	3.0	3.1
PwB----- Poinsett-Waubay	78	71	39	29	57	2.9	3.0

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Spring wheat	Soybeans	Barley	Alfalfa hay	Bromegrass- alfalfa
	Bu	Bu	Bu	Bu	Bu	Tons	AUM*
Ra----- Ranslo-Harriet	16	9	6	6	9	0.4	0.9
Rb----- Rauville	21	5	3	7	4	---	0.7
RfA----- Renshaw-Fordville	32	39	21	12	33	1.7	1.7
RfB----- Renshaw-Fordville	25	33	19	10	29	1.5	1.6
RsA----- Renshaw-Sioux	20	28	16	8	25	1.4	1.4
RsB----- Renshaw-Sioux	15	25	14	6	22	1.3	1.3
Ru----- Ryan-Ludden	20	9	6	7	9	0.2	0.7
SaA----- Sinai-Nutley	65	61	33	24	49	2.4	2.5
SbB----- Sioux	9	18	11	4	17	1.0	1.0
SoB. Sioux							
SrD----- Sioux-Renshaw	5	11	6	2	10	0.8	0.8
SrE----- Sioux-Renshaw	1	4	2	1	4	0.5	0.5
SsE. Sioux-Renshaw							
Sw----- Southam	4	1	1	1	1	---	0.1
To----- Tonka	52	23	13	19	18	0.4	1.4
Va----- Vallers	23	8	5	6	9	0.1	1.0
Vh----- Vallers-Hamerly	50	32	18	16	27	0.9	2.3
VoA----- Vienna-Brookings	77	71	39	29	57	2.9	2.9
VoB----- Vienna-Brookings	72	67	37	27	54	2.7	2.8

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 7.--RANGELAND CHARACTERISTIC VEGETATION AND PRODUCTIVITY

Range site, soil name, and map symbols	Potential natural plant community		Potential annual production for kind of growing season		
	Common plant name	Composition	Favorable	Average	Unfavorable
		Pct	Lb/acre	Lb/acre	Lb/acre
Clayey-----	Little bluestem-----	30	4,000	3,300	2,300
Aberdeen: An, En, Hd, Na	Big bluestem-----	20			
Cresbard: Cr	Needlegrasses-----	20			
Harmony: Hd, Rm	Western wheatgrass-----	5			
Nutley: NsB, SaA	Sideoats grama-----	5			
Sinai: NsB, SaA	Blue grama-----	5			
	Bluegrasses-----	5			
	Sedges-----	5			
	Climax forbs-----	5			
Claypan-----	Western wheatgrass-----	35	3,100	2,600	1,800
Cavour: Ca, Cr	Needlegrass-----	20			
Nahon: An, En, Na	Big bluestem-----	10			
	Blue grama-----	10			
	Bluegrasses-----	10			
	Switchgrass-----	5			
	Sedges-----	5			
	Climax forbs-----	5			
Limy Subirrigated-----	Little bluestem-----	40	5,300	4,400	2,800
Bearden: Ba, BaB	Big bluestem-----	20			
Cubden: Cu, Cw, Cx	Needlegrasses-----	20			
Divide: Dd, Md	Blue grama-----	5			
Hamerly: HaA, HaB, Hb, Vh	Bluegrasses-----	5			
Rondell: Bc	Sedges-----	5			
	Climax forbs-----	5			
Loamy Overflow-----	Big bluestem-----	60	5,500	4,600	3,200
Aastad: Aa, FmA, FmB, FmB, FoB	Sedges-----	10			
Badger: Cw	Switchgrass-----	5			
Brookings: KrB, Ks, VoA, VoB	Canada wildrye-----	5			
La Prairie: BsE, Lh	Porcupinegrass-----	5			
Waubay: PsB, PwA, PwB	Little bluestem-----	5			
	Sideoats grama-----	5			
	Climax forbs-----	5			
Saline Lowland-----	Cordgrass-----	55	4,800	4,400	3,500
Harriet: Hr, Ra	Nuttall alkaligrass-----	15			
Ludden, saline: Lx	Western wheatgrass-----	10			
	Saltgrass-----	10			
	Switchgrass-----	5			
	Sedges-----	5			
Saline Subirrigated-----	Little bluestem-----	45	5,300	4,400	3,100
Holmquist: Lh	Big bluestem-----	20			
Playmoor: Pc, Pm	Indiangrass-----	10			
Vallers: Va	Switchgrass-----	10			
	Bluegrass-----	5			
	Sedges-----	5			
	Climax forbs-----	5			
Sandy-----	Big bluestem or sand bluestem	35	3,900	3,200	2,200
Egeland: EgB, MaA, MaB, MaC	Little bluestem-----	25			
Embden: EgB	Prairie sandreed-----	15			
Maddock: MaA, MaB, MaC	Needlegrasses-----	10			
	Sideoats grama-----	5			
	Sedges-----	5			
	Climax forbs-----	5			

TABLE 7.--RANGELAND CHARACTERISTIC VEGETATION AND PRODUCTIVITY--Continued

Range site, soil name, and map symbols	Potential natural plant community		Potential annual production for kind of growing season		
	Common plant name	Composition	Favorable	Average	Unfavorable
		Pct	Lb/acre	Lb/acre	Lb/acre
Shallow----- Kloten: KbE	Little bluestem-----	35	2,800	2,300	1,600
	Needlegrasses-----	25			
	Sideoats grama-----	10			
	Blue grama-----	10			
	Western wheatgrass-----	5			
	Sedges-----	5			
	Climax forbs-----	5			
Shallow Marsh----- Parnell: BpE, FnB, FpB, FpC, Hb, Pa	Sedges-----	45	7,400	6,800	5,400
	Rivergrass-----	30			
	Climax forbs-----	10			
	American mannagrass-----	5			
	Reedgrasses-----	5			
	Prairie cordgrass-----	5			
Shallow to Gravel----- Arvilla: ArB Renshaw: RfA, RfB, RsA, RsB, SrD, SrE, SsE	Needleandthread-----	45	2,900	2,400	1,500
	Little bluestem-----	10			
	Prairie dropseed-----	10			
	Blue grama or hairy grama----	10			
	Plains muhly-----	5			
	Bluegrasses-----	5			
	Sedges-----	5			
	Climax forbs-----	5			
	Climax shrubs-----	5			
Silty----- Aastad: FoC Barnes: BnD, BoE, BpE, BsE Beotia: BbA, Bc, Hm Eckman: EaA, EbB, EcB Edgeley: EdC Fordville: Fd, RfA, RfB Forman: FmA, FmB, FnB, FoB, FoC, FpB, FpC, KtB Gardena: EbB Great Bend: Gb, Gp, GzC Hetland: HtA, HuB Kranzburg: KrB, Ks, KtB La Prairie: La Poinsett: PrC, PsB, PwA, PwB Putney: Ep, Gp Vienna: VoA, VoB	Little bluestem-----	30	4,200	3,500	2,400
	Big bluestem-----	20			
	Needlegrasses-----	20			
	Prairie dropseed-----	5			
	Blue grama-----	5			
	Bluegrasses-----	5			
	Sedges-----	5			
	Climax forbs-----	5			
	Climax shrubs-----	5			
Subirrigated----- Colvin: Cn Lamoure: Lm, Pm Lowe: Lo Marysland: Md Mauvais: MfB, MgB Minnewasta: MnA, MoB Minnewaukan: Mw Ranslo: Ra Vallers: Vh	Big bluestem-----	60	5,900	5,400	4,300
	Indiangrass-----	10			
	Little bluestem-----	10			
	Switchgrass-----	10			
	Canada wildrye-----	5			
	Prairie cordgrass-----	5			
	Sedges-----	5			
	Climax forbs-----	5			

TABLE 7.--RANGELAND CHARACTERISTIC VEGETATION AND PRODUCTIVITY--Continued

Range site, soil name, and map symbols	Potential natural plant community		Potential annual production for kind of growing season		
	Common plant name	Composition	Favorable	Average	Unfavorable
		<u>Pct</u>	<u>Lb/acre</u>	<u>Lb/acre</u>	<u>Lb/acre</u>
Thin Claypan----- Exline: En, Ep, Na Ferne: Ca Ryan: Ru	Western wheatgrass-----	55	1,700	1,400	800
	Blue grama-----	25			
	Buffalograss-----	5			
	Saltgrass-----	5			
	Sedges-----	5			
	Climax forbs-----	5			
Thin Upland----- Buse: BnD, BoE, BpE, BrE, BsE, BxE, FoB, FoC, FpB, FpC, KbE, Krb Huffton: BaB, GzC Langhei: BrE Rusklyn: HuB, PrC, PsB Zell: EcB, GzC	Little bluestem-----	35	3,500	2,900	2,000
	Needlegrasses-----	20			
	Big bluestem-----	10			
	Prairie dropseed-----	10			
	Sideoats grama-----	5			
	Blue grama-----	5			
	Sedges-----	5			
	Climax forbs-----	5			
	Climax shrubs-----	5			
Very Shallow----- Orthents: Or Sioux: BxE, Rsa, Rsb, SbB, SoB, SrD, SrE, SsE	Needleandthread-----	55	2,200	1,900	1,100
	Blue grama or hairy grama----	20			
	Sedges-----	10			
	Plains muhly-----	5			
	Sideoats grama-----	5			
	Climax forbs-----	5			
Wetland----- Dovray: Do Ludden: Lu, Lx, Ru Oldham: Oh Rauville: Rb	Prairie cordgrass-----	60	7,000	6,400	5,100
	Reedgrasses-----	10			
	Reed canarygrass-----	10			
	Sedges-----	5			
	Switchgrass-----	5			
	Canada wildrye-----	5			
	Bluegrasses-----	5			
Wet Meadow----- Tonka: Cx, To	Sedges-----	40	5,000	4,600	3,200
	Reedgrasses-----	15			
	Prairie cordgrass-----	15			
	Reed canarygrass-----	10			
	Western wheatgrass-----	5			
	Bluegrasses-----	5			
	Rushes-----	5			
	Climax forbs-----	5			

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(In Day County, none of the soils are assigned to windbreak suitability group 7. The symbol < means less than; > means more than. Dashes indicate that trees generally do not grow to the given height on the soils in that group)

Windbreak suitability group, soil name, and map symbols	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Group 1----- Aastad: Aa, FmA, FmB, FmB, FoB, FoC Bearden: Ba, BaB Brookings: KrB, Ks, VoA, VoB Cubden: Cu, Cw, Cx Divide: Dd, Md Embsen: EgB Gardena: EbB Hamerly: HaA, HaB, Hb, Vh La Prairie: BsE, La, Lh Waubay: PsB, PwA, PwB	Golden currant, Hansen hedgerose, juneberry, Mongolian cherry, Nanking cherry, Peking cotoneaster, redosier dogwood, skunkbush sumac, western sandcherry.	American plum, Amur maple, Arnold hawthorn, common chokecherry, common lilac, European cotoneaster, late lilac, sargent crabapple, Siberian apricot, Siberian peashrub, silver buffaloberry, Ussurian pear.	Austrian pine, blue spruce, bur oak, eastern redcedar, ponderosa pine, Rocky Mountain juniper, Russian mulberry, Russian-olive, Scotch pine, Siberian crabapple, Siberian larch, white spruce.	Golden willow, green ash, hackberry, silver maple*, white poplar, white willow.	Carolina poplar, eastern cottonwood, northwest poplar, robusta poplar, Siberian elm.
Group 2----- Badger: Cw Lamoure: Lm, Pm Minnewaukan: Mw	American plum, Amur honeysuckle, common lilac, golden currant, Hansen hedgerose, juneberry, late lilac, Mongolian cherry, Nanking cherry, Peking cotoneaster, silver buffaloberry.	Amur maple, Arnold hawthorn, common chokecherry, European cotoneaster, sargent crabapple, Siberian apricot, Siberian peashrub, Ussurian pear.	Austrian pine, Black Hills spruce, blue spruce, bur oak, eastern redcedar, Manchurian crabapple, ponderosa pine, Rocky Mountain juniper, Russian mulberry, Russian-olive, Scotch pine, Siberian crabapple, white spruce.	Golden willow, green ash, hackberry, silver maple*, white willow.	Carolina poplar, eastern cottonwood, northwest poplar, plains cottonwood, robusta poplar.
Group 3----- Barnes: BnD Beotia: BbA, Bc, Hm Eckman: EaA, EbB, EcB Forman: FmA, FmB, FnB, FoB, FoC, FpB, FpC, KtB Great Bend: Gb, Gp, GzC Kranzburg: KrB, Ks, KtB Poinsett: PrC, PsB, PwA, PwB Putney: Ep, Gp Vienna: VoA, VoB	Amur honeysuckle, golden currant, Hansen hedgerose, late lilac, Mongolian cherry, Nanking cherry, Peking cotoneaster, redosier dogwood, Russian almond, skunkbush sumac, western sandcherry.	American plum, Amur maple, Arnold hawthorn, common chokecherry, common lilac, eastern redcedar, European cotoneaster, Manchurian apricot, Rocky Mountain juniper, Siberian apricot, Siberian peashrub, silver buffaloberry.	Austrian pine, Black Hills spruce, blue spruce, bur oak, hackberry, Manchurian crabapple, ponderosa pine, Russian mulberry, Russian-olive, Scotch pine, Siberian crabapple, Ussurian pear, white poplar, white spruce.	Green ash, silver maple.	Siberian elm.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Windbreak suitability group, soil name, and map symbols	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Group 4----- Aberdeen: An, En, Hd, Na Cresbard: Cr Harmony: Hd, Hm Hetland: HtA, HuB Nuttley: NsB, SsA Sinai: NsB, SsA	Amur honeysuckle, European cotoneaster, golden currant, Nanking cherry, Peking cotoneaster, Russian almond, skunkbush sumac.	American plum, Amur honeysuckle, common chokecherry, common lilac, eastern redcedar, Manchurian apricot, Manchurian crabapple, Rocky Mountain juniper, Siberian apricot, Siberian crabapple, Siberian peashrub, silver buffaloberry, Ussurian pear.	Bur oak, hackberry, ponderosa pine, Russian-olive.	Green ash, Siberian elm, silver maple.	---
Group 5----- Egeland: EgB, MaA, MaB, MaC Maddock: MaA, MaB, MaC	Amur honeysuckle, European cotoneaster, golden currant, Nanking cherry, Peking cotoneaster, Russian almond, silver buffaloberry, skunkbush sumac, western sandcherry.	American plum, Arnold hawthorn, common chokecherry, common lilac, eastern redcedar, Rocky Mountain juniper, Siberian apricot, Siberian peashrub, Ussurian pear.	Bur oak, green ash, hackberry, Manchurian crabapple, ponderosa pine, Russian-olive, Siberian crabapple, white poplar.	Siberian elm-----	---
Group 6----- Arvilla: ArB Edgeley: EdC Fordville: Fd, RfA, RfB Renshaw: RfA, RfB, RfA, RfB	Amur honeysuckle, common lilac, European cotoneaster, Peking cotoneaster, Siberian peashrub, silver buffaloberry.	Eastern redcedar, hackberry, Manchurian crabapple, Rocky Mountain juniper, Siberian crabapple, Ussurian pear.	Bur oak, green ash, ponderosa pine, Russian-olive.	Siberian elm-----	---
Group 8----- Buse: BnD, FoB, FoC, FpB, FpC, KrB Huffton: BaB, GzC Rondell: Bc Rusklyn: HuB, PrC, PsB Zell: EcB, GzC	American plum, Amur honeysuckle, common lilac, European cotoneaster, golden currant, Peking cotoneaster, Siberian peashrub, silver buffaloberry, skunkbush sumac.	Eastern redcedar, hackberry, Rocky Mountain juniper, Russian-olive, Ussurian pear.	Green ash, ponderosa pine, Siberian elm.	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Windbreak suitability group, soil name, and map symbols	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Group 9----- Cavour: Ca, Cr Nahon: An, En, Na Ranslo: Ra	Amur honeysuckle, common lilac, eastern redcedar, Rocky Mountain juniper, Russian almond, Siberian peashrub, silver buffaloberry, Ussurian pear.	Green ash, ponderosa pine, Russian-olive, Siberian elm.	---	---	---
Group 10----- Aquents: Aq Barnes: BoE, BpE, BsE Buse: BoE, BpE, BrE, BsE, BxE, KbE Colvin: Cn Dovray: Do Exline: En, Ep, Na Ferne: Ca Harriet: Hr, Ra Holmquist: Lh Kloten: KbE Langhei: BrE Lowe: Lo Ludden: Lu, Lw, Lx, Ru Ludden, saline: Lx Marysland: Md Mauvais: MfB, MgB Minnewasta: MnA, MoB Oldham: Oh Orthents: Or Parnell: BpE, FnB, FpB, FpC, Hb, Pa Playmoor: Pc, Pm Rauville: Rb Renshaw: SrD, SrE, SsE Ryan: Ru Sioux: BxE, RsA, RsB, SbB, SoB, SrD, SrE, SsE Southam: Sw Tonka: Cx, To Vallers: Va, Vh	None-----	None-----	None-----	None-----	None.

* Silver maple is not adapted to Bearden, Cubden, Divide, Hamerly, Lamoure, Lowe, or Marysland soils because of the calcareous surface layer of these soils.

TABLE 9.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Aa----- Aastad	Slight-----	Slight-----	Slight-----	Slight.
An: Aberdeen-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Nahon-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Aq----- Aquentz	Severe: ponding, excess salt.	Severe: ponding, excess salt.	Severe: ponding, excess salt.	Severe: ponding.
ArB----- Arvilla	Slight-----	Slight-----	Moderate: slope.	Slight.
Ba----- Bearden	Moderate: wetness.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
BaB: Bearden-----	Moderate: wetness.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Huffton-----	Slight-----	Slight-----	Moderate: slope.	Severe: erodes easily.
BbA----- Beotia	Slight-----	Slight-----	Slight-----	Slight.
Bc: Beotia-----	Slight-----	Slight-----	Slight-----	Slight.
Rondell-----	Slight-----	Slight-----	Slight-----	Slight.
BnD: Buse-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Barnes-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
BoE: Buse-----	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: large stones.
Barnes-----	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: slope.
BpE: Buse-----	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: large stones.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
BpE:				
Barnes-----	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: slope.
Parnell-----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
BrE:				
Buse-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Langhei-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
BsE:				
Buse-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
La Prairie-----	Severe: flooding.	Slight-----	Moderate: flooding.	Slight.
Barnes-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
BxE:				
Buse-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Sioux-----	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.
Ca:				
Cavour-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Ferney-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Cn:				
Colvin-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Cr:				
Cresbard-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Cavour-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Cu:				
Cubden-----	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Cw:				
Cubden-----	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Badger-----	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Cx: Cubden-----	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Tonka-----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Dd----- Divide	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Do----- Dovray	Severe: ponding, too clayey.	Severe: ponding, too clayey.	Severe: too clayey, ponding.	Severe: ponding, too clayey.
EaA----- Eckman	Slight-----	Slight-----	Slight-----	Slight.
EbB: Eckman-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Gardena-----	Slight-----	Slight-----	Moderate: slope.	Slight.
EcB: Eckman-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Zell-----	Slight-----	Slight-----	Moderate: slope.	Slight.
EdC----- Edgeley	Slight-----	Slight-----	Severe: slope.	Slight.
EgB: Egeland-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Embden-----	Slight-----	Slight-----	Moderate: slope.	Slight.
En: Exline-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: wetness.
Aberdeen-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Nahon-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Ep: Exline-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Putney-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Fd----- Fordville	Slight-----	Slight-----	Slight-----	Slight.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
FmA:				
Forman-----	Slight-----	Slight-----	Slight-----	Slight.
Aastad-----	Slight-----	Slight-----	Slight-----	Slight.
FmB:				
Forman-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Aastad-----	Slight-----	Slight-----	Slight-----	Slight.
FnB:				
Forman-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Aastad-----	Slight-----	Slight-----	Slight-----	Slight.
Parnell-----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
FoB:				
Forman-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Buse-----	Slight-----	Slight-----	Moderate: slope, small stones.	Slight.
Aastad-----	Slight-----	Slight-----	Slight-----	Slight.
FoC:				
Forman-----	Slight-----	Slight-----	Severe: slope.	Slight.
Buse-----	Slight-----	Slight-----	Severe: slope.	Slight.
Aastad-----	Slight-----	Slight-----	Moderate: slope.	Slight.
FpB:				
Forman-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Buse-----	Slight-----	Slight-----	Moderate: slope, small stones.	Slight.
Parnell-----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
FpC:				
Forman-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Buse-----	Slight-----	Slight-----	Severe: slope.	Slight.
Parnell-----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Gb----- Great Bend	Slight-----	Slight-----	Slight-----	Slight.
Gp: Great Bend-----	Slight-----	Slight-----	Slight-----	Slight.
Putney-----	Slight-----	Slight-----	Slight-----	Slight.
GzC: Great Bend-----	Slight-----	Slight-----	Severe: slope.	Slight.
Zell-----	Slight-----	Slight-----	Severe: slope.	Slight.
Huffton-----	Slight-----	Slight-----	Severe: slope.	Severe: erodes easily.
HaA----- Hamerly	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.
HaB----- Hamerly	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.
Hb: Hamerly-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.
Parnell-----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Hd: Harmony-----	Slight-----	Slight-----	Slight-----	Slight.
Aberdeen-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Hm: Harmony-----	Slight-----	Slight-----	Slight-----	Slight.
Beotia-----	Slight-----	Slight-----	Slight-----	Slight.
Hr----- Harriet	Severe: flooding, wetness, percs slowly.	Severe: wetness, excess sodium, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.
HtA----- Hetland	Slight-----	Slight-----	Slight-----	Slight.
HuB: Hetland-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Rusklyn-----	Slight-----	Slight-----	Moderate: slope.	Slight.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
KbE:				
Kloten-----	Severe: slope, thin layer, area reclaim.	Severe: slope, thin layer, area reclaim.	Severe: slope, thin layer, area reclaim.	Moderate: slope.
Buse-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
KrB:				
Kranzburg-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Brookings-----	Severe: wetness.	Slight-----	Moderate: wetness.	Slight.
Buse-----	Slight-----	Slight-----	Moderate: slope, small stones.	Slight.
Ks:				
Kranzburg-----	Slight-----	Slight-----	Slight-----	Slight.
Brookings-----	Severe: wetness.	Slight-----	Moderate: wetness.	Slight.
KtB:				
Kranzburg-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Forman-----	Slight-----	Slight-----	Moderate: slope.	Slight.
La				
La Prairie-----	Severe: flooding.	Slight-----	Slight-----	Slight.
Lh:				
La Prairie-----	Severe: flooding.	Slight-----	Moderate: flooding.	Slight.
Holmquist-----	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Lm				
Lamoure-----	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
Lo				
Lowe-----	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Lu, Lw				
Ludden-----	Severe: flooding, ponding, too clayey.	Severe: ponding, too clayey.	Severe: too clayey, ponding, flooding.	Severe: ponding, too clayey.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Lx:				
Ludden-----	Severe: flooding, ponding, too clayey.	Severe: ponding, too clayey.	Severe: too clayey, ponding, flooding.	Severe: ponding, too clayey.
Ludden, saline-----	Severe: flooding, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness, flooding.	Severe: wetness, too clayey.
MaA:				
Maddock-----	Slight-----	Slight-----	Slight-----	Slight.
Egeland-----	Slight-----	Slight-----	Slight-----	Slight.
MaB:				
Maddock-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Egeland-----	Slight-----	Slight-----	Moderate: slope.	Slight.
MaC:				
Maddock-----	Slight-----	Slight-----	Severe: slope.	Slight.
Egeland-----	Slight-----	Slight-----	Severe: slope.	Slight.
Md:				
Marysland-----	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Divide-----	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
MfB:				
Mauvais	Severe: wetness.	Moderate: wetness, excess salt.	Severe: wetness.	Moderate: wetness.
MgB:				
Mauvais	Severe: wetness.	Moderate: wetness, large stones.	Severe: large stones, wetness.	Moderate: large stones, wetness.
MnA:				
Minnewasta	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
MoB:				
Minnewasta	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: large stones, wetness.
Mw:				
Minnewaukan	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Na:				
Nahon-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Na:				
Aberdeen-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Exline-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: wetness.
NsB:				
Nutley-----	Severe: percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, percs slowly.	Severe: too clayey.
Sinai-----	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey.	Slight.
Oh-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Or-----	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Slight.
Pa-----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Pc-----	Severe: flooding, wetness, excess salt.	Severe: wetness, excess salt.	Severe: wetness, flooding, excess salt.	Severe: wetness.
Pm:				
Playmoor-----	Severe: flooding, wetness, excess salt.	Severe: wetness, excess salt.	Severe: wetness, flooding, excess salt.	Severe: wetness.
Lamoure-----	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
PrC:				
Poinsett-----	Slight-----	Slight-----	Severe: slope.	Slight.
Rusklyn-----	Slight-----	Slight-----	Severe: slope.	Slight.
PsB:				
Poinsett-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Rusklyn-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Waubay-----	Severe: wetness.	Slight-----	Moderate: wetness.	Slight.
PwA:				
Poinsett-----	Slight-----	Slight-----	Slight-----	Slight.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
PwA: Waubay-----	Severe: wetness.	Slight-----	Moderate: wetness.	Slight.
PwB: Poinsett-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Waubay-----	Severe: wetness.	Slight-----	Moderate: wetness.	Slight.
Ra: Ranslo-----	Severe: flooding, wetness, excess sodium.	Severe: excess sodium.	Severe: wetness, excess sodium.	Moderate: wetness.
Harriet-----	Severe: flooding, wetness, percs slowly.	Severe: wetness, excess sodium, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.
Rb----- Rauville	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
RfA: Renshaw-----	Slight-----	Slight-----	Slight-----	Slight.
Fordville-----	Slight-----	Slight-----	Slight-----	Slight.
RfB: Renshaw-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Fordville-----	Slight-----	Slight-----	Moderate: slope.	Slight.
RSA: Renshaw-----	Slight-----	Slight-----	Slight-----	Slight.
Sioux-----	Slight-----	Slight-----	Moderate: small stones.	Slight.
RSB: Renshaw-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Sioux-----	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
Ru: Ryan-----	Severe: flooding, ponding, percs slowly.	Severe: ponding, excess sodium.	Severe: ponding, percs slowly.	Severe: ponding.
Ludden-----	Severe: flooding, ponding, too clayey.	Severe: ponding, too clayey.	Severe: too clayey, ponding, flooding.	Severe: ponding, too clayey.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
SaA: Sinai-----	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Slight.
Nutley-----	Severe: percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, percs slowly.	Severe: too clayey.
SbB----- Sioux	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
SoB----- Sioux	Moderate: small stones.	Moderate: small stones.	Severe: large stones, small stones.	Severe: large stones.
SrD: Sioux-----	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
Renshaw-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
SrE: Sioux-----	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Renshaw-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
SsE: Sioux-----	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: large stones.
Renshaw-----	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Moderate: large stones, slope.
Sw----- Southam	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
To----- Tonka	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Va----- Vallers	Severe: flooding, wetness, excess salt.	Severe: wetness, excess salt.	Severe: wetness, excess salt.	Severe: wetness.
Vh: Vallers-----	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Vh: Hamerly-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.
VoA: Vienna-----	Slight-----	Slight-----	Slight-----	Slight.
Brookings-----	Severe: wetness.	Slight-----	Moderate: wetness.	Slight.
VoB: Vienna-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Brookings-----	Severe: wetness.	Slight-----	Moderate: wetness.	Slight.

TABLE 10.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
Aa----- Aastad	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
An: Aberdeen-----	Fair	Fair	Good	Good	Poor	Very poor.	Very poor.	Very poor.	Very poor.
Nahon-----	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.
Aq----- Aguents	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good.
ArB----- Arvilla	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Ba----- Bearden	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Poor.
BaB: Bearden-----	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Poor.
Huffton-----	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
BbA----- Beotia	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Bc: Beotia-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Rondell-----	Good	Good	Good	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
BnD: Buse-----	Very poor.	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Barnes-----	Poor	Good	Good	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
BoE: Buse-----	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Barnes-----	Very poor.	Very poor.	Good	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.
BpE: Buse-----	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Barnes-----	Very poor.	Very poor.	Good	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
BpE: Parnell-----	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Good	Good.
BrE: Buse-----	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Langhei-----	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
BsE: Buse-----	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
La Prairie-----	Good	Good	Good	Good	Fair	Poor	Good	Very poor.	Very poor.
Barnes-----	Very poor.	Very poor.	Good	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.
BxE: Buse-----	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Sioux-----	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Ca: Cavour-----	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Ferney-----	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Cn----- Colvin	Poor	Good	Fair	Very poor.	Fair	Poor	Fair	Fair	Fair.
Cr: Cresbard-----	Fair	Fair	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Cavour-----	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Cu----- Cubden	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Poor.
Cw: Cubden-----	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Poor.
Badger-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Poor	Poor.
Cx: Cubden-----	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Poor.
Tonka-----	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Poor	Good	Good.
Dd----- Divide	Fair	Fair	Fair	Good	Poor	Very poor.	Fair	Very poor.	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
Do----- Dovray	Very poor.	Poor	Poor	Very poor.	Poor	Poor	Poor	Good	Good.
EaA----- Eckman	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
EbB: Eckman-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Gardena-----	Good	Good	Good	Good	Good	Good	Fair	Poor	Very poor.
EcB: Eckman-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Zell-----	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
EdC----- Edgeley	Fair	Good	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
EgB: Egeland-----	Fair	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Emlden-----	Fair	Good	Good	Good	Fair	Fair	Fair	Poor	Very poor.
En: Exline-----	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Aberdeen-----	Fair	Fair	Good	Good	Poor	Very poor.	Very poor.	Very poor.	Very poor.
Nahon-----	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Ep: Exline-----	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Putney-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Fd----- Fordville	Good	Fair	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
FmA, FmB: Forman-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Poor	Very poor.
Aastad-----	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
FnB: Forman-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Poor	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
FnB:									
Aastad-----	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
Parnell-----	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Good	Good.
FoB:									
Forman-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Poor	Very poor.
Buse-----	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Aastad-----	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
FoC:									
Forman-----	Fair	Good	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
Buse-----	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Aastad-----	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
FpB:									
Forman-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Buse-----	Good	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Parnell-----	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Good	Good.
FpC:									
Forman-----	Fair	Good	Good	Fair	Poor	Very poor.	Poor	Poor	Very poor.
Buse-----	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Parnell-----	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Good	Good.
Gb:									
Great Bend-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Gp:									
Great Bend-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Putney-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
GzC:									
Great Bend-----	Fair	Good	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herba- ceous plants	Planted woody plants	Native decid- uous trees	Native conif- erous plants	Native shrubs	Wetland plants	Shallow water areas
GzC:									
Zell-----	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Huffton-----	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
HaA-----	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Poor.
Hamerly									
HaB-----	Fair	Good	Fair	Good	Poor	Very poor.	Fair	Poor	Very poor.
Hamerly									
Hb:									
Hamerly-----	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Poor.
Parnell-----	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Good	Good.
Hd:									
Harmony-----	Good	Fair	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Aberdeen-----	Fair	Fair	Good	Good	Poor	Very poor.	Very poor.	Very poor.	Very poor.
Hm:									
Harmony-----	Good	Fair	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Beotia-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Poor	Very poor.
Hr-----	Very poor.	Poor	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Fair.
Harriet									
HtA-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Hetland									
HuB:									
Hetland-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Rusklyn-----	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
KbE:									
Kloten-----	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Buse-----	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
KrB:									
Kranzburg-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Brookings-----	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
KrB: Buse-----	Fair	Good	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Ks: Kranzburg-----	Good	Good	Good	Good	Fair	Very poor.	Poor	Very poor.	Very poor.
Brookings-----	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
KtB: Kranzburg-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Poor	Very poor.
Forman-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Poor	Very poor.
La----- La Prairie	Good	Good	Good	Good	Good	Poor	Good	Very poor.	Very poor.
Lh: La Prairie-----	Good	Good	Good	Good	Good	Poor	Good	Very poor.	Very poor.
Holmquist-----	Very poor.	Poor	Fair	Very poor.	Poor	Poor	Poor	Fair	Fair.
Lm----- Lamoure	Good	Good	Fair	Good	Fair	Poor	Fair	Fair	Fair.
Lo----- Lowe	Fair	Good	Fair	Good	Fair	Poor	Poor	Fair	Fair.
Lu----- Ludden	Poor	Poor	Fair	Very poor.	Fair	Poor	Fair	Fair	Fair.
Lw----- Ludden	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good.
Lx: Ludden-----	Poor	Poor	Fair	Very poor.	Fair	Poor	Fair	Fair	Fair.
Ludden, saline----	Poor	Poor	Fair	Very poor.	Poor	Poor	Poor	Fair	Fair.
MaA, MaB: Maddock-----	Fair	Fair	Good	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.
Egeland-----	Fair	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
MaC: Maddock-----	Poor	Fair	Good	Fair	Poor	Good	Fair	Poor	Very poor.
Egeland-----	Poor	Fair	Good	Fair	Poor	Very poor.	Fair	Very poor.	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
Md:									
Marysland-----	Poor	Poor	Fair	Good	Poor	Poor	Fair	Good	Fair.
Divide-----	Fair	Fair	Fair	Good	Fair	Very poor.	Fair	Very poor.	Very poor.
MfB-----	Fair	Good	Fair	Very poor.	Poor	Very poor.	Fair	Poor	Poor.
Mauvais									
MgB-----	Very poor.	Very poor.	Fair	Very poor.	Poor	Very poor.	Fair	Poor	Poor.
Mauvais									
MnA-----	Poor	Good	Fair	Very poor.	Poor	Very poor.	Fair	Poor	Poor.
Minnewasta									
MoB-----	Very poor.	Very poor.	Fair	Very poor.	Poor	Very poor.	Fair	Poor	Poor.
Minnewasta									
Mw-----	Poor	Good	Fair	Good	Poor	Very poor.	Fair	Fair	Very poor.
Minnewaukan									
Na:									
Nahon-----	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Aberdeen-----	Fair	Fair	Good	Good	Poor	Very poor.	Very poor.	Very poor.	Very poor.
Exline-----	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
NsB:									
Nutley-----	Fair	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Sinai-----	Fair	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Oh-----	Very poor.	Poor	Poor	Very poor.	Poor	Poor	Poor	Good	Good.
Oldham									
Or-----	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Orthents									
Pa-----	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Good	Good.
Parnell									
Pc-----	Poor	Poor	Fair	Very poor.	Poor	Poor	Poor	Fair	Fair.
Playmoor									
Pm:									
Playmoor-----	Very poor.	Poor	Fair	Very poor.	Poor	Poor	Poor	Fair	Fair.
Lamoure-----	Very poor.	Poor	Fair	Good	Fair	Poor	Fair	Fair	Fair.
PrC:									
Poinsett-----	Fair	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
PrC:									
Rusklyn-----	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
PsB:									
Poinsett-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Rusklyn-----	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Waubay-----	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
PwA, PwB:									
Poinsett-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Waubay-----	Good	Good	Good	Good	Fair	Very poor.	Fair	Very poor.	Very poor.
Ra:									
Ranslo-----	Poor	Poor	Poor	Good	Poor	Very poor.	Poor	Poor	Poor.
Harriet-----	Very poor.	Poor	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Fair.
Rb-----	Very poor.	Poor	Fair	Very poor.	Poor	Very poor.	Fair	Fair	Fair.
Rauville									
RfA:									
Renshaw-----	Fair	Fair	Poor	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Fordville-----	Good	Fair	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
RfB:									
Renshaw-----	Poor	Fair	Poor	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Fordville-----	Good	Fair	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
RsA:									
Renshaw-----	Fair	Fair	Poor	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Sioux-----	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
RsB:									
Renshaw-----	Poor	Fair	Poor	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Sioux-----	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herba-ceous plants	Planted woody plants	Native decid-uous trees	Native conif-erous plants	Native shrubs	Wetland plants	Shallow water areas
Ru:									
Ryan-----	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Fair.
Ludden-----	Poor	Poor	Fair	Very poor.	Fair	Poor	Fair	Fair	Fair.
SaA:									
Sinai-----	Good	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Nutley-----	Good	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
SbB:									
Sioux-----	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
SoB:									
Sioux-----	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
SrD, SrE:									
Sioux-----	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Renshaw-----	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
SsE:									
Sioux-----	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Renshaw-----	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
Sw:									
Southam-----	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good.
To:									
Tonka-----	Poor	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Good	Good.
Va:									
Vallers-----	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Poor	Fair	Fair.
Vh:									
Vallers-----	Poor	Good	Poor	Very poor.	Poor	Poor	Fair	Fair	Fair.
Hamerly-----	Good	Good	Good	Good	Fair	Poor	Fair	Poor	Poor.
VoA, VoB:									
Vienna-----	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Brookings-----	Good	Good	Fair	Good	Fair	Poor	Fair	Very poor.	Very poor.

TABLE 11.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Aa----- Aastad	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
An: Aberdeen-----	Severe: cutbanks cave.	Severe: shrink-swell.	Moderate: wetness.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Nahon-----	Severe: cutbanks cave.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Aq----- Aquents	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.
ArB----- Arvilla	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Slight.
Ba----- Bearden	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.
BaB: Bearden-----	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.
Huffton-----	Slight-----	Moderate: shrink-swell.	Slight-----	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
BbA----- Beotia	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Bc: Beotia-----	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength; frost action.
Rondell-----	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Severe: low strength, frost action.
BnD: Buse-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
BnD:					
Barnes-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.
BoE:					
Buse-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Barnes-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
BpE:					
Buse-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Barnes-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Parnell-----	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
BrE:					
Buse-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Langhei-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
BsE:					
Buse-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
La Prairie-----	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.
Barnes-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
BxE:					
Buse-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sioux-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ca:					
Cavour-----	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Ferney-----	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Cn----- Colvin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.
Cr: Cresbard-----	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Cavour-----	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Cu----- Cubden	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.
Cw: Cubden-----	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.
Badger-----	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Cx: Cubden-----	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.
Tonka-----	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Dd----- Divide	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.
Do----- Dovray	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
EaA----- Eckman	Slight-----	Slight-----	Slight-----	Slight-----	Severe: frost action.
EbB: Eckman-----	Slight-----	Slight-----	Slight-----	Moderate: slope.	Severe: frost action.
Gardena-----	Moderate: wetness.	Slight-----	Moderate: wetness.	Moderate: slope.	Severe: frost action.
EcB: Eckman-----	Slight-----	Slight-----	Slight-----	Moderate: slope.	Severe: frost action.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
EcB: Zell-----	Slight-----	Slight-----	Slight-----	Moderate: slope.	Severe: frost action.
EdC----- Edgeley	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
EgB: Egeland-----	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Slight.
Embden-----	Severe: cutbanks cave.	Slight-----	Moderate: wetness.	Moderate: slope.	Moderate: frost action.
En: Exline-----	Severe: cutbanks cave, wetness.	Severe: shrink-swell.	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Aberdeen-----	Severe: cutbanks cave.	Severe: shrink-swell.	Moderate: wetness.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Nahon-----	Severe: cutbanks cave.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Ep: Exline-----	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Putney-----	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Severe: low strength, frost action.
Fd----- Fordville	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight.
FmA: Forman-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.
Aastad-----	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
FmB: Forman-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Aastad-----	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
FnB:					
Forman-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Aastad-----	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Parnell-----	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
FoB:					
Forman-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Buse-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Aastad-----	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
FoC:					
Forman-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Buse-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Aastad-----	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
FpB, FpC:					
Forman-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Buse-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Parnell-----	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Gb:					
Great Bend	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Severe: low strength, frost action.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Gp: Great Bend-----	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Severe: low strength, frost action.
Putney-----	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Severe: low strength, frost action.
GzC: Great Bend-----	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Severe: low strength, frost action.
Zell-----	Slight-----	Slight-----	Slight-----	Moderate: slope.	Severe: frost action.
Huffton-----	Slight-----	Moderate: shrink-swell.	Slight-----	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
HaA----- Hamerly	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.
HaB----- Hamerly	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: frost action.
Hb: Hamerly-----	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.
Parnell-----	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Hd: Harmony-----	Severe: cutbanks cave.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Aberdeen-----	Severe: cutbanks cave.	Severe: shrink-swell.	Moderate: wetness.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Hm: Harmony-----	Severe: cutbanks cave.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Beotia-----	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Hr----- Harriet	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
HtA----- Hetland	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
HuB: Hetland-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Rusklyn-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
KbE: Kloten-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Buse-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
KrB: Kranzburg-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Brookings-----	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
Buse-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Ks: Kranzburg-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Brookings-----	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
KtB: Kranzburg-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Forman-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
La----- La Prairie	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Lh: La Prairie-----	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.
Holmquist-----	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.
Lm----- Lamoure	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.
Lo----- Lowe	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
Lu, Lw----- Ludden	Severe: cutbanks cave, ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Lx: Ludden-----	Severe: cutbanks cave, ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Ludden, saline---	Severe: cutbanks cave, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
MaA: Maddock-----	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight.
Egeland-----	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight.
MaB, MaC: Maddock-----	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Slight.
Egeland-----	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Slight.
Md: Marysland-----	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.
Divide-----	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
MfB----- Mauvais	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.
MgB----- Mauvais	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.
MnA, MoB----- Minnewasta	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.
Mw----- Minnewaukan	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Na: Nahon-----	Severe: cutbanks cave.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Aberdeen-----	Severe: cutbanks cave.	Severe: shrink-swell.	Moderate: wetness.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Exline-----	Severe: cutbanks cave, wetness.	Severe: shrink-swell.	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
NsB: Nutley-----	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Sinai-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Oh----- Oldham	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Or----- Orthents	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Slight.
Pa----- Parnell	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Pc----- Playmoor	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Pm: Playmoor-----	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
Lamoure-----	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
PrC: Poinsett-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Rusklyn-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
PsB: Poinsett-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Rusklyn-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Waubay-----	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.
PwA: Poinsett-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Waubay-----	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.
PwB: Poinsett-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Waubay-----	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.
Ra: Ranslo-----	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, flooding.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Ra: Harriet-----	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
Rb----- Rauville	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
RfA: Renshaw-----	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight.
Fordville-----	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight.
RfB: Renshaw-----	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Slight.
Fordville-----	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Slight.
RsA: Renshaw-----	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight.
Sioux-----	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight.
RsB: Renshaw-----	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Slight.
Sioux-----	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Slight.
Ru: Ryan-----	Severe: cutbanks cave, ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Ludden-----	Severe: cutbanks cave, ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
SaA: Sinai-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Nutley-----	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
SbB----- Sioux	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Slight.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
SoB----- Sioux	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: slope, large stones.	Moderate: large stones.
SrD: Sioux-----	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Renshaw-----	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
SrE, SsE: Sioux-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Renshaw-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sw----- Southam	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
To----- Tonka	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Va----- Vallers	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, frost action.
Vh: Vallers-----	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, frost action.
Hamerly-----	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.
VoA: Vienna-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Brookings-----	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
VoB: Vienna-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Brookings-----	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.

TABLE 12.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Aa----- Aastad	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
An: Aberdeen-----	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey, too sandy.	Moderate: wetness.	Poor: too clayey, hard to pack, excess sodium.
Nahon-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey, excess sodium.	Moderate: wetness.	Poor: too clayey, hard to pack, excess sodium.
Aq----- Aquents	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey, too sandy.	Severe: ponding.	Poor: too clayey, ponding.
ArB----- Arvilla	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Ba----- Bearden	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
BaB: Bearden-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
Huffton-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight-----	Slight-----	Good.
BbA----- Beotia	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey, thin layer.
Bc: Beotia-----	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey, thin layer.
Rondell-----	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness, too clayey, too sandy.	Moderate: wetness.	Poor: too clayey.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BnD:					
Buse-----	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Barnes -----	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
BoE:					
Buse-----	Severe: percs slowly, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: slope.
Barnes -----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
BpE:					
Buse-----	Severe: percs slowly, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: slope.
Barnes -----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Parnell -----	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
BrE:					
Buse-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Langhei -----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
BsE:					
Buse-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
La Prairie -----	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Fair: too clayey.
Barnes -----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
BxE:					
Buse-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BxE: Sioux-----	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Ca: Cavour-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, excess sodium.	Moderate: wetness.	Poor: hard to pack, excess sodium.
Ferney-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey, excess sodium.	Moderate: wetness.	Poor: too clayey, hard to pack, excess sodium.
Cn----- Colvin	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Cr: Cresbard-----	Severe: wetness, percs slowly.	Moderate: wetness.	Severe: wetness, too clayey, excess sodium.	Moderate: wetness.	Poor: too clayey, hard to pack, excess sodium.
Cavour-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, excess sodium.	Moderate: wetness.	Poor: hard to pack, excess sodium.
Cu----- Cubden	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
Cw: Cubden-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
Badger-----	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Cx: Cubden-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
Tonka-----	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Dd----- Divide	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Do----- Dovray	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
EaA----- Eckman	Moderate: percs slowly.	Moderate: seepage.	Slight-----	Slight-----	Good.
EbB: Eckman-----	Moderate: percs slowly.	Moderate: seepage, slope.	Slight-----	Slight-----	Good.
Gardena-----	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness.
EcB: Eckman-----	Moderate: percs slowly.	Moderate: seepage, slope.	Slight-----	Slight-----	Good.
Zell-----	Moderate: percs slowly.	Moderate: seepage, slope.	Slight-----	Slight-----	Good.
EdC----- Edgeley	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, hard to pack.
EgB: Egeland-----	Slight-----	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Poor: seepage.
Emlden-----	Severe: wetness.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Fair: too sandy.
En: Exline-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey, too sandy.	Severe: wetness.	Poor: too clayey, hard to pack, excess sodium.
Aberdeen-----	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey, too sandy.	Moderate: wetness.	Poor: too clayey, hard to pack, excess sodium.
Nahon-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey, excess sodium.	Moderate: wetness.	Poor: too clayey, hard to pack, excess sodium.
Ep: Exline-----	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey, too sandy.	Moderate: wetness.	Poor: too clayey, hard to pack, excess sodium.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ep: Putney-----	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight-----	Poor: too clayey.
Fd----- Fordville	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
FmA: Forman-----	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Aastad-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
FmB: Forman-----	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Aastad-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
FnB: Forman-----	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Aastad-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Parnell-----	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
FoB: Forman-----	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Buse-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Aastad-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
FoC: Forman-----	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Buse-----	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
FoC: Aastad-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
FpB, FpC: Forman-----	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Buse-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Parnell-----	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Gb----- Great Bend	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey, thin layer.
Gp: Great Bend-----	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey, thin layer.
Putney-----	Severe: percs slowly.	Moderate: seepage.	Severe: too clayey.	Slight-----	Poor: too clayey.
GzC: Great Bend-----	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey, thin layer.
Zell-----	Moderate: percs slowly.	Severe: slope.	Slight-----	Slight-----	Good.
Huffton-----	Severe: percs slowly.	Severe: slope.	Slight-----	Slight-----	Good.
HaA, HaB----- Hamerly	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Hb: Hamerly-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Parnell-----	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Hd: Harmony-----	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: too clayey, too sandy.	Slight-----	Poor: too clayey.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Hd: Aberdeen-----	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey, too sandy.	Moderate: wetness.	Poor: too clayey, hard to pack, excess sodium.
Hm: Harmony-----	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: too clayey, too sandy.	Slight-----	Poor: too clayey.
Beotia-----	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey, thin layer.
Hr----- Harriet	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
HtA----- Hetland	Severe: percs slowly.	Slight-----	Moderate: too clayey.	Slight-----	Poor: hard to pack.
HuB: Hetland-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Poor: hard to pack.
Rusklyn-----	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
KbE: Kloten-----	Severe: seepage, thin layer, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: thin layer, slope, area reclaim.
Buse-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
KrB: Kranzburg-----	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Brookings-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Buse-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Ks: Kranzburg-----	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Brookings-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
KtB: Kranzburg-----	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Forman-----	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
La----- La Prairie	Severe: wetness.	Moderate: seepage, wetness.	Severe: wetness.	Moderate: flooding, wetness.	Fair: too clayey.
Lh: La Prairie-----	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Fair: too clayey.
Holmquist-----	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Lm----- Lamoure	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Lo----- Lowe	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Lu, Lw----- Ludden	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, ponding.
Lx: Ludden-----	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, ponding.
Ludden, saline----	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
MaA, MaB: Maddock-----	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Egeland-----	Slight-----	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Poor: seepage.
MaC: Maddock-----	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MaC: Egeland-----	Slight-----	Severe: seepage, slope.	Moderate: too sandy.	Severe: seepage.	Poor: seepage.
Md: Marysland-----	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
Divide-----	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
MfB----- Mauvais	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
MgB----- Mauvais	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
MnA, MoB----- Minnewasta	Severe: wetness, percs slowly.	Severe: seepage.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Mw----- Minnewaukan	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Na: Nahon-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey, excess sodium.	Moderate: wetness.	Poor: too clayey, hard to pack, excess sodium.
Aberdeen-----	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey, too sandy.	Moderate: wetness.	Poor: too clayey, hard to pack, excess sodium.
Exline-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey, too sandy.	Severe: wetness.	Poor: too clayey, hard to pack, excess sodium.
NsB: Nutley-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
Sinai-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Oh----- Oldham	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Or----- Orthents	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Pa----- Parnell	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Pc----- Playmoor	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Pm: Playmoor-----	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Lamoure-----	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
PrC: Poinsett-----	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Rusklyn-----	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
PsB: Poinsett-----	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Rusklyn-----	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Waubay-----	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.
PwA: Poinsett-----	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Waubay-----	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
PwB:					
Poinsett-----	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Waubay-----	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.
Ra:					
Ranslo-----	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, excess sodium.	Severe: flooding, wetness.	Poor: hard to pack, wetness, excess sodium.
Harriet-----	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Rb-----					
Rauville	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
RfA, RfB:					
Renshaw-----	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Fordville-----	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
RsA, RsB:					
Renshaw-----	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Sioux-----	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Ru:					
Ryan-----	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
Ludden-----	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, ponding.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
SaA: Sinai-----	Severe: percs slowly.	Slight-----	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
Nutley-----	Severe: percs slowly.	Slight-----	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
SbB----- Sioux	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
SoB----- Sioux	Severe: poor filter.	Severe: seepage, large stones.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
SrD: Sioux-----	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Renshaw-----	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
SrE: Sioux-----	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Renshaw-----	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
SsE: Sioux-----	Severe: poor filter, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Renshaw-----	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Sw----- Southam	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
To----- Tonka	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Va----- Vallers	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Vh: Vallers-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Hamerly-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
VoA: Vienna-----	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Brookings-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
VoB: Vienna-----	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Brookings-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.

TABLE 13.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Aa----- Aastad	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
An: Aberdeen-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Nahon-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium, excess salt.
Aq----- Aquents	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, too clayey, excess salt.
ArB----- Arvilla	Good-----	Probable-----	Probable-----	Poor: too sandy, small stones, area reclaim.
Ba----- Bearden	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
BaB: Bearden-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Huffton-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
BbA----- Beotia	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Bc: Beotia-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Rondell-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
BnD: Buse-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Barnes-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
BoE:				
Buse-----	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim, slope.
Barnes-----	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
BpE:				
Buse-----	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim, slope.
Barnes-----	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
Parnell-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
BrE:				
Buse-----	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Langhei-----	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
BsE:				
Buse-----	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
La Prairie-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Barnes-----	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
BxE:				
Buse-----	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Sioux-----	Fair: slope.	Probable-----	Probable-----	Poor: too sandy, small stones, area reclaim.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ca: Cavour-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Ferney-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Cn----- Colvin	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Cr: Cresbard-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Cavour-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Cu----- Cubden	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Cw: Cubden-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Badger-----	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Cx: Cubden-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Tonka-----	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Dd----- Divide	Fair: wetness.	Probable-----	Probable-----	Poor: too sandy, small stones, area reclaim.
Do----- Dovray	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
EaA----- Eckman	Good-----	Improbable: excess fines.	Improbable: excess fines.	Good.
EbB: Eckman-----	Good-----	Improbable: excess fines.	Improbable: excess fines.	Good.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
EbB: Gardena-----	Good-----	Improbable: excess fines.	Improbable: excess fines.	Good.
EcB: Eckman-----	Good-----	Improbable: excess fines.	Improbable: excess fines.	Good.
Zell-----	Good-----	Improbable: excess fines.	Improbable: excess fines.	Good.
EdC----- Edgeley	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
EgB: Egeland-----	Good-----	Improbable: thin layer.	Improbable: too sandy.	Fair: small stones.
Embden-----	Good-----	Improbable: excess fines.	Improbable: excess fines.	Good.
En: Exline-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Aberdeen-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Nahon-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium, excess salt.
Ep: Exline-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Putney-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
Fd----- Fordville	Good-----	Probable-----	Probable-----	Poor: too sandy, small stones, area reclaim.
FmA, FmB: Forman-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Aastad-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
FnB: Forman-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
FnB:				
Aastad-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Parnell-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
FoB, FoC:				
Forman-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Buse-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Aastad-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
FpB, FpC:				
Forman-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Buse-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Parnell-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Gb----- Great Bend	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Gp----- Great Bend	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Putney-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
GzC:				
Great Bend-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Zell-----	Good-----	Improbable: excess fines.	Improbable: excess fines.	Good.
Huffton-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
HaA, HaB----- Hamerly	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Hb:				
Hamerly-----	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Parnell-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Hd:				
Harmony-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Aberdeen-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Hm:				
Harmony-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Beotia-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Hr:				
Harriet-----	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, wetness.
HtA:				
Hetland-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
HuB:				
Hetland-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Rusklyn-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
KbE:				
Kloten-----	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Buse-----	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
KrB:				
Kranzburg-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Brookings-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
KrB: Buse-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Ks: Kranzburg-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Brookings-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
KtB: Kranzburg-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Forman-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
La----- La Prairie	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Lh: La Prairie-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Holmquist-----	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Lm----- Lamoure	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Lo----- Lowe	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Lu, Lw----- Ludden	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Lx: Ludden-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Ludden, saline-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
MaA, MaB, MaC: Maddock-----	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy.
Egeland-----	Good-----	Improbable: thin layer.	Improbable: too sandy.	Fair: small stones.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Md: Marysland-----	Poor: wetness.	Probable-----	Probable-----	Poor: wetness.
Divide-----	Fair: wetness.	Probable-----	Probable-----	Poor: too sandy, small stones, area reclaim.
MfB----- Mauvais	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, excess salt.
MgB----- Mauvais	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
MnA----- Minnewasta	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, excess salt.
MoB----- Minnewasta	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Mw----- Minnewaukan	Poor: wetness.	Probable-----	Improbable: too sandy.	Poor: too sandy, small stones, wetness.
Na: Nahon-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium, excess salt.
Aberdeen-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Exline-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
NsB: Nutley-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Sinai-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Oh----- Oldham	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Or----- Orthents	Good-----	Probable-----	Probable-----	Poor: too sandy, small stones, area reclaim.
Pa----- Parnell	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Pc----- Playmoor	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, wetness.
Pm: Playmoor-----	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, wetness.
Lamoure-----	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
PrC: Poinsett-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Rusklyn-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
PsB: Poinsett-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Rusklyn-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
Waubay-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
PwA, PwB: Poinsett-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Waubay-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ra: Ranslo-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Harriet-----	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, wetness.
Rb----- Rauville	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RfA, RfB: Renshaw-----	Good-----	Probable-----	Probable-----	Poor: too sandy, small stones, area reclaim.
Fordville-----	Good-----	Probable-----	Probable-----	Poor: too sandy, small stones, area reclaim.
RsA, RsB: Renshaw-----	Good-----	Probable-----	Probable-----	Poor: too sandy, small stones, area reclaim.
Sioux-----	Good-----	Probable-----	Probable-----	Poor: too sandy, small stones, area reclaim.
Ru: Ryan-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, wetness.
Ludden-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
SaA: Sinai-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Nutley-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
SbB----- Sioux	Good-----	Probable-----	Probable-----	Poor: too sandy, small stones, area reclaim.
SoB----- Sioux	Fair: large stones.	Probable-----	Probable-----	Poor: too sandy, small stones, area reclaim.
SrD: Sioux-----	Good-----	Probable-----	Probable-----	Poor: too sandy, small stones, area reclaim.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SrD: Renshaw-----	Good-----	Probable-----	Probable-----	Poor: too sandy, small stones, area reclaim.
SrE: Sioux-----	Poor: slope.	Probable-----	Probable-----	Poor: too sandy, small stones, area reclaim.
Renshaw-----	Fair: slope.	Probable-----	Probable-----	Poor: too sandy, small stones, area reclaim.
SsE: Sioux-----	Fair: large stones, slope.	Probable-----	Probable-----	Poor: too sandy, small stones, area reclaim.
Renshaw-----	Fair: slope.	Probable-----	Probable-----	Poor: small stones, area reclaim, slope.
Sw----- Southam	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
To----- Tonka	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Va----- Vallers	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, wetness.
Vh: Vallers-----	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Hamerly-----	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
VoA, VoB: Vienna-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Brookings-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

TABLE 14.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Aa----- Aastad	Slight-----	Moderate: piping, wetness.	Frost action---	Wetness-----	Erodes easily, wetness.	Erodes easily.
An: Aberdeen-----	Moderate: seepage.	Severe: piping, excess sodium.	Deep to water	Percs slowly, erodes easily, excess sodium.	Erodes easily, percs slowly.	Excess sodium, erodes easily, percs slowly.
Nahon-----	Slight-----	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, erodes easily, excess sodium.	Erodes easily, percs slowly.	Excess sodium, erodes easily, percs slowly.
Aq----- Aquentz	Moderate: seepage.	Severe: piping, ponding.	Ponding, percs slowly, frost action.	Ponding-----	Erodes easily, ponding.	Wetness, excess salt, erodes easily.
ArB----- Arvilla	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Ba----- Bearden	Moderate: seepage.	Severe: wetness.	Percs slowly, frost action.	Wetness-----	Erodes easily, wetness, percs slowly.	Erodes easily, rooting depth, percs slowly.
BaB: Bearden-----	Moderate: seepage.	Severe: wetness.	Percs slowly, frost action.	Wetness-----	Erodes easily, wetness, percs slowly.	Erodes easily, rooting depth, percs slowly.
Huffton-----	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, percs slowly.	Erodes easily	Erodes easily, percs slowly.
BbA----- Beotia	Moderate: seepage.	Severe: piping.	Deep to water	Percs slowly, erodes easily.	Erodes easily	Erodes easily.
Bc: Beotia-----	Moderate: seepage.	Severe: piping.	Deep to water	Percs slowly, erodes easily.	Erodes easily	Erodes easily.
Rondell-----	Moderate: seepage.	Severe: piping.	Deep to water	Percs slowly---	Erodes easily, percs slowly.	Erodes easily, percs slowly.
BnD: Buse-----	Severe: slope.	Severe: piping.	Deep to water	Slope-----	Slope, erodes easily.	Slope, erodes easily.
Barnes-----	Severe: slope.	Severe: piping.	Deep to water	Slope-----	Slope, erodes easily.	Slope, erodes easily.
BoE: Buse-----	Severe: slope.	Severe: large stones.	Deep to water	Slope, large stones, excess salt.	Slope, large stones.	Large stones, slope.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
BoE:						
Barnes-----	Severe: slope.	Severe: piping.	Deep to water	Slope-----	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
BpE:						
Buse-----	Severe: slope.	Severe: large stones.	Deep to water	Slope, large stones, excess salt.	Slope, large stones.	Large stones, slope.
Barnes-----	Severe: slope.	Severe: piping.	Deep to water	Slope-----	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
Farnell-----	Slight-----	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
BrE:						
Buse-----	Severe: slope.	Severe: piping.	Deep to water	Slope-----	Slope, erodes easily.	Slope, erodes easily.
Langhei-----	Severe: slope.	Moderate: piping.	Deep to water	Slope-----	Slope-----	Slope.
BsE:						
Buse-----	Severe: slope.	Severe: piping.	Deep to water	Slope-----	Slope, erodes easily.	Slope, erodes easily.
La Prairie-----	Moderate: seepage.	Severe: piping.	Deep to water	Flooding-----	Favorable-----	Favorable.
Barnes-----	Severe: slope.	Severe: piping.	Deep to water	Slope-----	Slope, erodes easily.	Slope, erodes easily.
BxE:						
Buse-----	Severe: slope.	Severe: piping.	Deep to water	Slope-----	Slope, erodes easily.	Slope, erodes easily.
Sioux-----	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.
Ca:						
Cavour-----	Slight-----	Severe: excess sodium.	Deep to water	Percs slowly, rooting depth.	Erodes easily, percs slowly.	Excess sodium, erodes easily, rooting depth.
Ferney-----	Slight-----	Severe: excess sodium.	Deep to water	Percs slowly---	Percs slowly---	Excess sodium, percs slowly.
Cn:						
Colvin	Moderate: seepage.	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Cr:						
Cresbard-----	Slight-----	Severe: excess sodium.	Deep to water	Percs slowly---	Erodes easily, percs slowly.	Excess sodium, erodes easily, percs slowly.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Cr: Cavour-----	Slight-----	Severe: excess sodium.	Deep to water	Peres slowly, rooting depth.	Erodes easily, peres slowly.	Excess sodium, erodes easily, rooting depth.
Cu----- Cubden	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness-----	Erodes easily, wetness.	Erodes easily.
Cw: Cubden-----	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness-----	Erodes easily, wetness.	Erodes easily.
Badger-----	Slight-----	Severe: hard to pack, wetness.	Peres slowly, flooding, frost action.	Wetness, peres slowly, erodes easily.	Erodes easily, wetness, peres slowly.	Wetness, erodes easily, peres slowly.
Cx: Cubden-----	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness-----	Erodes easily, wetness.	Erodes easily.
Tonka-----	Slight-----	Severe: ponding.	Ponding, peres slowly, frost action.	Ponding, peres slowly, erodes easily.	Erodes easily, ponding, peres slowly.	Wetness, erodes easily, peres slowly.
Dd----- Divide	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness-----	Wetness, too sandy.	Favorable.
Do----- Dovray	Slight-----	Severe: hard to pack, ponding.	Ponding, peres slowly.	Ponding, slow intake, peres slowly.	Erodes easily, ponding, peres slowly.	Wetness, erodes easily, peres slowly.
EaA----- Eckman	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing---	Erodes easily, soil blowing.	Erodes easily.
EbB: Eckman-----	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Erodes easily, soil blowing.	Erodes easily.
Gardena-----	Severe: seepage.	Severe: piping.	Deep to water	Slope, soil blowing.	Erodes easily, soil blowing.	Erodes easily.
EcB: Eckman-----	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Erodes easily, soil blowing.	Erodes easily.
Zell-----	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Erodes easily, soil blowing.	Erodes easily.
EdC----- Edgeley	Moderate: seepage, depth to rock, slope.	Severe: hard to pack.	Deep to water	Slope, depth to rock.	Depth to rock, erodes easily.	Erodes easily, depth to rock.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
EgB: Egeland-----	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
Embden-----	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, soil blowing.	Soil blowing---	Favorable.
En: Exline-----	Slight-----	Severe: wetness, excess sodium.	Percs slowly, cutbanks cave, excess salt.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Excess sodium, erodes easily, percs slowly.
Aberdeen-----	Moderate: seepage.	Severe: piping, excess sodium.	Deep to water	Percs slowly, erodes easily, excess sodium.	Erodes easily, percs slowly.	Excess sodium, erodes easily, percs slowly.
Nahon-----	Slight-----	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, erodes easily, excess sodium.	Erodes easily, percs slowly.	Excess sodium, erodes easily, percs slowly.
Ep: Exline-----	Slight-----	Severe: excess sodium.	Deep to water	Percs slowly, erodes easily, excess sodium.	Erodes easily, percs slowly.	Excess sodium, erodes easily, percs slowly.
Putney-----	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Fd----- Fordville	Severe: seepage.	Severe: seepage.	Deep to water	Rooting depth	Too sandy-----	Rooting depth.
FmA: Forman-----	Slight-----	Severe: piping.	Deep to water	Favorable-----	Erodes easily	Erodes easily.
Aastad-----	Slight-----	Moderate: piping, wetness.	Frost action---	Wetness-----	Erodes easily, wetness.	Erodes easily.
FmB: Forman-----	Moderate: slope.	Severe: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
Aastad-----	Slight-----	Moderate: piping, wetness.	Frost action---	Wetness-----	Erodes easily, wetness.	Erodes easily.
FnB: Forman-----	Moderate: slope.	Severe: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
Aastad-----	Slight-----	Moderate: piping, wetness.	Frost action---	Wetness-----	Erodes easily, wetness.	Erodes easily.
Parnell-----	Slight-----	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
FoB:						
Forman-----	Moderate: slope.	Severe: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
Buse-----	Moderate: slope.	Severe: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
Aastad-----	Slight-----	Moderate: piping, wetness.	Frost action---	Wetness-----	Erodes easily, wetness.	Erodes easily.
FoC:						
Forman-----	Moderate: slope.	Severe: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
Buse-----	Moderate: slope.	Severe: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
Aastad-----	Moderate: slope.	Moderate: piping, wetness.	Slope-----	Slope, wetness.	Erodes easily, wetness.	Erodes easily.
FpB, FpC:						
Forman-----	Moderate: slope.	Severe: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
Buse-----	Moderate: slope.	Severe: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
Parnell-----	Slight-----	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Gb:						
Great Bend-----	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Percs slowly---	Erodes easily	Erodes easily.
Gp:						
Great Bend-----	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Percs slowly---	Erodes easily	Erodes easily.
Putney-----	Moderate: seepage.	Severe: piping.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
GzC:						
Great Bend-----	Moderate: seepage, slope.	Moderate: thin layer, piping.	Deep to water	Slope, percs slowly.	Erodes easily	Erodes easily.
Zell-----	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
Huffton-----	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, percs slowly.	Erodes easily	Erodes easily, percs slowly.
HaA:						
Hamerly-----	Moderate: seepage.	Severe: piping, wetness.	Frost action---	Wetness-----	Erodes easily, wetness.	Erodes easily.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
HaB----- Hamerly	Moderate: seepage, slope.	Severe: piping, wetness.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily.
Hb: Hamerly-----	Moderate: seepage.	Severe: piping, wetness.	Frost action--	Wetness-----	Erodes easily, wetness.	Erodes easily.
Parnell-----	Slight-----	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Hd: Harmony-----	Moderate: seepage.	Severe: piping.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Aberdeen-----	Moderate: seepage.	Severe: piping, excess sodium.	Deep to water	Percs slowly, erodes easily, excess sodium.	Erodes easily, percs slowly.	Excess sodium, erodes easily, percs slowly.
Hm: Harmony-----	Moderate: seepage.	Severe: piping.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Beotia-----	Moderate: seepage.	Severe: piping.	Deep to water	Percs slowly, erodes easily.	Erodes easily	Erodes easily.
Hr----- Harriet	Moderate: seepage.	Severe: piping, wetness, excess sodium.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, excess sodium, erodes easily.
HtA----- Hetland	Slight-----	Moderate: piping, hard to pack.	Deep to water	Percs slowly---	Erodes easily, percs slowly.	Erodes easily, percs slowly.
HuB: Hetland-----	Moderate: slope.	Moderate: piping, hard to pack.	Deep to water	Slope, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Rusklyn-----	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
KbE: Kloten-----	Severe: seepage, slope.	Severe: piping, thin layer.	Deep to water	Slope, thin layer.	Slope, area reclaim.	Slope, area reclaim.
Buse-----	Severe: slope.	Severe: piping.	Deep to water	Slope-----	Slope, erodes easily.	Slope, erodes easily.
KrB: Kranzburg-----	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
Brookings-----	Moderate: seepage.	Slight-----	Deep to water	Excess salt---	Erodes easily	Erodes easily.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
KrB: Buse-----	Moderate: slope.	Severe: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
Ks: Kranzburg-----	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable-----	Erodes easily	Erodes easily.
Brookings-----	Moderate: seepage.	Slight-----	Deep to water	Excess salt----	Erodes easily	Erodes easily.
KtB: Kranzburg-----	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
Forman-----	Moderate: slope.	Severe: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
La----- La Prairie	Moderate: seepage.	Severe: piping.	Deep to water	Favorable-----	Favorable-----	Favorable.
Lh: La Prairie-----	Moderate: seepage.	Severe: piping.	Deep to water	Flooding-----	Favorable-----	Favorable.
Holmquist-----	Moderate: seepage.	Severe: piping, wetness.	Flooding-----	Wetness, flooding.	Wetness-----	Wetness.
Lm----- Lamoure	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
Lo----- Lowe	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action, cutbanks cave.	Wetness, flooding.	Wetness, too sandy.	Wetness.
Lu, Lw----- Ludden	Slight-----	Severe: hard to pack, ponding.	Ponding, percs slowly, flooding.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
Lx: Ludden-----	Slight-----	Severe: hard to pack, ponding.	Ponding, percs slowly, flooding.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
Ludden, saline---	Slight-----	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, excess salt, percs slowly.
MaA: Maddock-----	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Egeland-----	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty-----	Too sandy, soil blowing.	Droughty.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
MaB, MaC:						
Maddock-----	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Egeland-----	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
Md:						
Marysland-----	Severe: seepage.	Severe: seepage, wetness.	Flooding, frost action, cutbanks cave.	Wetness, flooding.	Wetness, too sandy.	Wetness.
Divide-----	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness-----	Wetness, too sandy.	Favorable.
MfB-----	Moderate: slope.	Severe: piping, wetness.	Frost action, slope.	Slope, wetness.	Wetness-----	Wetness, excess salt.
MgB-----	Moderate: slope.	Severe: wetness.	Frost action, slope.	Slope, wetness, droughty.	Large stones, wetness.	Large stones, wetness.
MnA-----	Slight-----	Severe: piping, wetness.	Perchs slowly, frost action.	Wetness, droughty.	Erodes easily, wetness, soil blowing.	Wetness, erodes easily, droughty.
MoB-----	Moderate: slope.	Severe: piping, wetness.	Perchs slowly, frost action, slope.	Slope, wetness, droughty.	Large stones, wetness, perchs slowly.	Large stones, wetness, droughty.
Mw-----	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Ponding, too sandy, soil blowing.	Wetness, droughty.
Na:						
Nahon-----	Slight-----	Severe: hard to pack, excess sodium.	Deep to water	Perchs slowly, erodes easily, excess sodium.	Erodes easily, perchs slowly.	Excess sodium, erodes easily, perchs slowly.
Aberdeen-----	Moderate: seepage.	Severe: piping, excess sodium.	Deep to water	Perchs slowly, erodes easily, excess sodium.	Erodes easily, perchs slowly.	Excess sodium, erodes easily, perchs slowly.
Exline-----	Slight-----	Severe: wetness, excess sodium.	Perchs slowly, cutbanks cave, excess salt.	Wetness, perchs slowly.	Erodes easily, wetness, perchs slowly.	Excess sodium, erodes easily, perchs slowly.
NsB:						
Nutley-----	Moderate: slope.	Severe: hard to pack.	Deep to water	Slope, droughty, slow intake.	Perchs slowly---	Droughty, perchs slowly.
Sinai-----	Moderate: slope.	Severe: hard to pack.	Deep to water	Slope, slow intake, perchs slowly.	Erodes easily, perchs slowly.	Erodes easily, perchs slowly.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Oh----- Oldham	Slight-----	Severe: hard to pack, wetness.	Peres slowly, frost action.	Wetness, peres slowly.	Erodes easily, wetness, peres slowly.	Wetness, erodes easily, peres slowly.
Or----- Orthents	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy-----	Droughty, rooting depth.
Pa----- Parnell	Slight-----	Severe: hard to pack, ponding.	Ponding, peres slowly, frost action.	Ponding, peres slowly.	Erodes easily, ponding, peres slowly.	Wetness, erodes easily, peres slowly.
Pc----- Playmoor	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action, cutbanks cave.	Wetness, flooding, excess salt.	Wetness, too sandy.	Wetness, excess salt.
Pm: Playmoor-----	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action, cutbanks cave.	Wetness, flooding, excess salt.	Wetness, too sandy.	Wetness, excess salt.
Lamoure-----	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
PrC: Poinsett-----	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
Rusklyn-----	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
PsB: Poinsett-----	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
Rusklyn-----	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
Waubay-----	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable-----	Erodes easily	Erodes easily.
PwA: Poinsett-----	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable-----	Erodes easily	Erodes easily.
Waubay-----	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable-----	Erodes easily	Erodes easily.
PwB: Poinsett-----	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
PwB: Waubay-----	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable-----	Erodes easily	Erodes easily.
Ra: Ranslo-----	Slight-----	Severe: wetness, excess sodium.	Peres slowly, flooding, frost action.	Wetness, peres slowly.	Erodes easily, wetness.	Wetness, excess sodium, erodes easily.
Harriet-----	Moderate: seepage.	Severe: piping, wetness, excess sodium.	Peres slowly, flooding, frost action.	Wetness, peres slowly.	Erodes easily, wetness.	Wetness, excess sodium, erodes easily.
Rb----- Rauville	Severe: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Wetness-----	Wetness.
RfA: Renshaw-----	Severe: seepage.	Severe: seepage.	Deep to water	Droughty-----	Too sandy-----	Droughty.
Fordville-----	Severe: seepage.	Severe: seepage.	Deep to water	Rooting depth	Too sandy-----	Rooting depth.
RfB: Renshaw-----	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy-----	Droughty.
Fordville-----	Severe: seepage.	Severe: seepage.	Deep to water	Slope, rooting depth.	Too sandy-----	Rooting depth.
RsA: Renshaw-----	Severe: seepage.	Severe: seepage.	Deep to water	Droughty-----	Too sandy-----	Droughty.
Sioux-----	Severe: seepage.	Severe: seepage.	Deep to water	Droughty-----	Too sandy-----	Droughty.
RsB: Renshaw-----	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy-----	Droughty.
Sioux-----	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy-----	Droughty.
Ru: Ryan-----	Slight-----	Severe: hard to pack, ponding, excess sodium.	Ponding, peres slowly, flooding.	Ponding, peres slowly.	Erodes easily, ponding, peres slowly.	Wetness, excess sodium, erodes easily.
Ludden-----	Slight-----	Severe: hard to pack, ponding.	Ponding, peres slowly, flooding.	Ponding, slow intake, peres slowly.	Ponding, peres slowly.	Wetness, peres slowly.
SaA: Sinai-----	Slight-----	Severe: hard to pack.	Deep to water	Slow intake, peres slowly.	Erodes easily, peres slowly.	Erodes easily, peres slowly.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
SaA: Nutley-----	Slight-----	Severe: hard to pack.	Deep to water	Droughty, slow intake.	Percs slowly---	Droughty, percs slowly.
SbB----- Sioux	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty, fast intake.	Too sandy-----	Droughty.
SoB----- Sioux	Severe: seepage.	Severe: seepage.	Deep to water	Slope, large stones, droughty.	Large stones, too sandy.	Large stones, droughty.
SrD, SrE: Sioux-----	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.
Renshaw-----	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.
SsE: Sioux-----	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, large stones, droughty.	Slope, large stones, too sandy.	Large stones, slope, droughty.
Renshaw-----	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.
Sw----- Southam	Slight-----	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, excess salt, erodes easily.
To----- Tonka	Slight-----	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Va----- Vallers	Slight-----	Severe: piping, wetness.	Frost action, excess salt.	Wetness, excess salt.	Erodes easily, wetness.	Wetness, excess salt, erodes easily.
Vh: Vallers-----	Slight-----	Severe: piping, wetness.	Frost action---	Wetness-----	Erodes easily, wetness.	Wetness, erodes easily.
Hamerly-----	Moderate: seepage.	Severe: piping, wetness.	Frost action---	Wetness-----	Erodes easily, wetness.	Erodes easily.
VoA: Vienna-----	Slight-----	Moderate: piping.	Deep to water	Favorable-----	Erodes easily	Erodes easily.
Brookings-----	Moderate: seepage.	Slight-----	Deep to water	Excess salt----	Erodes easily	Erodes easily.
VoB: Vienna-----	Moderate: slope.	Moderate: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
VoB: Brookings-----	Moderate: seepage.	Slight-----	Deep to water	Excess salt----	Erodes easily	Erodes easily.

TABLE 15.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Aa----- Aastad	0-14	Loam-----	ML, CL	A-6, A-7	0-5	95-100	95-100	80-95	50-75	35-45	10-20
	14-29	Clay loam-----	CL	A-7	0-5	95-100	90-100	75-95	50-75	40-50	15-25
	29-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	85-100	75-95	55-75	35-50	12-25
An: Aberdeen-----	0-12	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
	12-37	Silty clay, clay, silty clay loam.	ML, MH	A-7	0	100	100	95-100	90-100	45-75	15-40
	37-45	Silty clay loam, silty clay.	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	85-100	35-65	15-30
	45-60	Stratified very fine sand to clay.	ML, CL, CL-ML, CH	A-4, A-6, A-7	0	100	100	95-100	85-100	20-56	3-33
Nahon-----	0-7	Silty clay loam	CL, ML	A-7, A-6	0	100	100	95-100	85-100	35-50	10-25
	7-8	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
	8-25	Silty clay, silty clay loam.	MH, CH, CL, ML	A-7	0	100	100	95-100	90-100	45-65	15-35
	25-40	Silty clay, silty clay loam, silt loam.	CL, CH, MH, ML	A-7, A-6	0	100	100	90-100	80-100	30-65	10-30
	40-60	Stratified very fine sand to clay.	CL, CH, ML, MH	A-7	0	100	100	90-100	75-100	40-70	15-35
Aq----- Aquentis	0-2	Loam-----	CL-ML, CL	A-4, A-6	0	100	100	85-95	70-80	25-40	5-15
	2-60	Stratified very fine sand to clay.	CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	90-100	25-50	5-25
ArB----- Arvilla	0-8	Sandy loam-----	SM, SC, SC-SM	A-2, A-4, A-6	0	95-100	90-100	50-80	20-45	15-30	NP-15
	8-19	Sandy loam, loam, coarse sandy loam.	SM, SC, SC-SM	A-2, A-4, A-6	0	90-100	85-100	50-80	20-45	15-40	NP-15
	19-60	Gravelly coarse sand, coarse sand, very gravelly coarse sand.	SP-SM, GP, SM, GP-GM	A-1, A-2, A-3	0	35-100	25-100	10-60	0-15	---	NP
Ba----- Bearden	0-8	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	20-40	5-20
	8-26	Silt loam, silty clay loam.	CL, CH	A-6, A-7	0	100	100	90-100	80-95	25-55	10-30
	26-39	Silt loam, silty clay loam, loam.	CL, CH	A-6, A-7	0	100	100	90-100	80-95	25-55	10-30
	39-60	Silt loam, silty clay loam, silty clay.	CL, CH	A-6, A-7	0	100	100	90-100	80-95	25-60	10-30

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BaB:											
Bearden-----	0-8	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	20-40	5-20
	8-26	Silt loam, silty clay loam.	CL, CH	A-6, A-7	0	100	100	90-100	80-95	25-55	10-30
	26-39	Silt loam, silty clay loam, loam.	CL, CH	A-6, A-7	0	100	100	90-100	80-95	25-55	10-30
	39-60	Silt loam, silty clay loam, silty clay.	CL, CH	A-6, A-7	0	100	100	90-100	80-95	25-60	10-30
Huffton-----	0-7	Silt loam-----	CL, ML	A-4, A-6	0	100	100	85-100	80-100	30-40	5-15
	7-25	Silt loam, loam, very fine sandy loam.	CL, CL-ML	A-4, A-6	0	100	100	85-100	80-100	25-40	5-15
	25-60	Silt loam, loam, very fine sandy loam.	CL, CL-ML	A-4, A-6	0	100	100	85-100	80-100	25-40	5-15
BbA-----	0-10	Silt loam-----	CL, ML	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	5-20
Beotia	10-24	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	100	100	95-100	90-100	32-50	10-20
	24-35	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	90-100	25-50	5-20
	35-60	Stratified very fine sand to clay.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	90-100	25-50	5-20
Bc:											
Beotia-----	0-10	Silt loam-----	CL, ML	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	5-20
	10-24	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	100	100	95-100	90-100	32-50	10-20
	24-35	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	90-100	25-50	5-20
	35-60	Stratified very fine sand to clay.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	90-100	25-50	5-20
Rondell-----	0-12	Silt loam-----	ML, CL	A-4, A-6	0	100	100	90-100	85-100	30-40	5-15
	12-31	Silt loam, silty clay loam.	CL	A-6, A-7, A-4	0	100	100	90-100	85-100	30-50	8-25
	31-60	Stratified very fine sand to clay.	CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	80-100	25-50	5-25
BnD:											
Buse-----	0-7	Loam-----	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-22	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	22-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Barnes-----	0-6	Loam-----	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	80-100	60-80	20-40	5-20
	6-13	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	13-32	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	32-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BoE: Buse-----	0-7	Loam-----	ML, CL	A-4, A-6	0-70	90-100	85-95	70-90	55-80	30-40	5-15
	7-22	Loam, clay loam, very stony loam.	CL	A-4, A-6	0-30	90-100	85-95	70-90	60-80	25-40	8-15
	22-60	Loam, clay loam, very stony loam.	CL	A-4, A-6	0-30	90-100	85-95	70-90	60-80	25-40	8-15
Barnes-----	0-6	Loam-----	CL	A-6	3-25	90-100	85-100	80-100	60-75	25-40	10-20
	6-13	Loam, clay loam, stony loam.	CL, CL-ML	A-4, A-6	0-20	90-100	85-100	75-95	60-80	25-40	5-20
	13-60	Loam, clay loam, stony loam.	CL, CL-ML	A-4, A-6	0-15	90-100	85-100	75-95	60-80	25-40	5-20
BpE: Buse-----	0-7	Loam-----	ML, CL	A-4, A-6	0-70	90-100	85-95	70-90	55-80	30-40	5-15
	7-22	Loam, clay loam, very stony loam.	CL	A-4, A-6	0-30	90-100	85-95	70-90	60-80	25-40	8-15
	22-60	Loam, clay loam, very stony loam.	CL	A-4, A-6	0-30	90-100	85-95	70-90	60-80	25-40	8-15
Barnes-----	0-6	Loam-----	CL	A-6	3-25	90-100	85-100	80-100	60-75	25-40	10-20
	6-13	Loam, clay loam, stony loam.	CL, CL-ML	A-4, A-6	0-20	90-100	85-100	75-95	60-80	25-40	5-20
	13-60	Loam, clay loam, stony loam.	CL, CL-ML	A-4, A-6	0-15	90-100	85-100	75-95	60-80	25-40	5-20
Parnell-----	0-17	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	17-38	Clay loam, silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	90-100	70-100	40-80	20-50
	38-60	Clay loam, clay, silty clay.	CL, CH	A-6, A-7	0	95-100	90-100	80-95	70-95	30-80	15-50
BrE: Buse-----	0-7	Loam-----	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-22	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	22-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Langhei-----	0-4	Clay loam-----	CL, ML	A-7, A-6	0	95-100	90-100	75-95	70-80	35-45	10-20
	4-19	Clay loam, silty clay loam.	CL, ML	A-7, A-6	0	95-100	90-100	75-95	70-80	35-45	10-20
	19-60	Clay loam, silty clay loam.	CL, ML	A-7, A-6	0	95-100	90-100	75-95	70-80	35-45	10-20
BsE: Buse-----	0-7	Loam-----	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-22	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	22-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BS&E:											
La Prairie-----	0-16	Loam-----	CL-ML, CL	A-4, A-6	0	100	100	85-95	70-80	25-40	5-15
	16-31	Silt loam, loam, clay loam.	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	50-90	25-50	5-25
	31-60	Silt loam, loam, clay loam.	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	70-90	25-50	5-25
Barnes-----	0-6	Loam-----	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	80-100	60-80	20-40	5-20
	6-13	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	13-32	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	32-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
B&E:											
Buse-----	0-7	Loam-----	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-22	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	22-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Sioux-----	0-6	Gravelly loam---	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	6-9	Gravelly loam, gravelly sandy loam, gravelly loamy sand.	SM, GM	A-4, A-2, A-1	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	9-60	Extremely gravelly sand, very gravelly loamy sand, very gravelly sand.	GM, GP, SM, SP	A-1	0-5	25-75	20-60	5-35	0-25	0-25	NP-5
Ca:											
Cavour-----	0-7	Loam-----	ML, CL	A-4, A-6, A-7-6	0	100	90-100	85-100	60-85	30-45	6-20
	7-19	Clay, clay loam, silty clay.	CL, CH	A-7, A-6	0	100	90-100	85-100	60-85	30-55	10-35
	19-31	Clay loam, clay, loam.	CL, CH	A-7, A-6	0	95-100	90-100	75-100	50-85	35-65	12-35
	31-60	Clay loam, loam	CL, CH	A-7, A-6	0-5	95-100	90-100	75-100	50-85	35-65	12-35
Ferney-----	0-4	Loam-----	CL	A-6	0	100	95-100	85-95	60-85	30-40	10-20
	4-15	Clay loam, clay	CL, CH, ML, MH	A-7	0-5	95-100	95-100	85-100	70-80	40-65	15-30
	15-60	Clay loam, clay	CL, CH	A-7	0-5	95-100	95-100	85-100	70-80	40-60	15-30
Cn:											
Colvin-----	0-7	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-30
	7-36	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	80-95	25-50	10-30
	36-60	Loam, silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	25-50	10-25
Cr:											
Cresbard-----	0-9	Loam-----	CL	A-6	0	100	90-100	85-100	60-80	30-40	10-20
	9-12	Clay loam, silty clay loam.	CL, ML	A-7, A-6	0	100	90-100	90-100	70-85	35-50	10-25
	12-20	Clay loam, silty clay, clay.	CL, CH	A-7, A-6	0	95-100	90-100	85-100	65-85	30-60	15-30
	20-30	Clay loam, silty clay, clay.	CL, CH	A-7	0	95-100	90-100	85-100	65-85	40-60	15-30
	30-60	Clay loam, loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0-5	95-100	90-100	85-100	50-95	25-55	10-25

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Cr:											
Cavour-----	0-7	Loam-----	ML, CL	A-4, A-6, A-7-6	0	100	90-100	85-100	60-85	30-45	6-20
	7-19	Clay, clay loam, silty clay.	CL, CH	A-7, A-6	0	100	90-100	85-100	60-85	30-55	10-35
	19-31	Clay loam, clay, loam.	CL, CH	A-7, A-6	0	95-100	90-100	75-100	50-85	35-65	12-35
	31-60	Clay loam, loam	CL, CH	A-7, A-6	0-5	95-100	90-100	75-100	50-85	35-65	12-35
Cu-----											
Cubden	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	80-100	35-50	10-25
	10-22	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	25-55	10-30
	22-60	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	20-55	10-30
Cw:											
Cubden-----	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	80-100	35-50	10-25
	10-22	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	25-55	10-30
	22-60	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	20-55	10-30
Badger-----											
	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-50	10-25
	10-30	Silty clay, clay, silty clay loam.	CH, ML, CL, MH	A-7	0	100	100	90-100	75-95	45-65	15-35
	30-60	Silty clay loam, silt loam, silty clay.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
Cx:											
Cubden-----	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	80-100	35-50	10-25
	10-22	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	25-55	10-30
	22-60	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	20-55	10-30
Tonka-----											
	0-17	Silt loam-----	CL, CL-ML	A-4, A-6	0-2	100	95-100	90-100	70-90	20-35	5-15
	17-42	Silty clay loam, clay loam, silty clay.	CH, CL	A-6, A-7	0-2	100	95-100	90-100	75-95	35-55	15-35
	42-60	Silty clay loam, clay loam, loam.	CL, CL-ML	A-6, A-7, A-4	0-3	90-100	85-100	60-100	50-90	25-50	5-30
Dd-----											
Divide	0-9	Loam-----	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-95	60-85	25-40	5-20
	9-25	Loam, clay loam, gravelly loam.	CL, CL-ML, SC-SM, SC	A-4, A-6, A-7	0-3	95-100	75-100	55-90	35-80	20-45	5-20
	25-60	Stratified sand to gravelly sand.	GM, SM, GP-GM, SP-SM	A-1, A-3, A-2-4	0-5	25-100	15-100	10-70	5-25	0-30	NP-5
Do-----											
Dovray	0-8	Silty clay-----	CH, MH, OH	A-7	0	100	100	95-100	85-95	56-76	33-49
	8-20	Clay, silty clay	CH, MH	A-7	0	100	100	95-100	85-95	56-76	33-49
	20-46	Clay, silty clay	CH, MH	A-7	0	100	100	90-100	85-95	56-76	33-49
	46-60	Clay, silty clay loam, loam.	CH, MH, CL	A-7	0	100	100	80-100	70-95	41-76	21-49

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
EaA----- Eckman	0-7	Very fine sandy loam.	ML	A-4	0	100	100	85-100	55-70	20-35	NP-10
	7-31	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	85-100	55-90	20-40	NP-10
	31-60	Silt loam, very fine sandy loam, fine sandy loam.	ML, SM	A-4	0	100	100	65-100	40-90	20-40	NP-10
EbB: Eckman-----	0-7	Very fine sandy loam.	ML	A-4	0	100	100	85-100	55-70	20-35	NP-10
	7-31	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	85-100	55-90	20-40	NP-10
	31-60	Silt loam, very fine sandy loam, fine sandy loam.	ML, SM	A-4	0	100	100	65-100	40-90	20-40	NP-10
Gardena-----	0-20	Very fine sandy loam.	ML, CL-ML, CL	A-4, A-6	0	100	100	85-100	55-70	15-30	NP-15
	20-60	Silt loam, very fine sandy loam, loam.	ML, CL-ML, CL	A-4, A-6	0	100	100	75-100	55-100	20-40	NP-15
EcB: Eckman-----	0-7	Very fine sandy loam.	ML	A-4	0	100	100	85-100	55-70	20-35	NP-10
	7-31	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	85-100	55-90	20-40	NP-10
	31-60	Silt loam, very fine sandy loam, fine sandy loam.	ML, SM	A-4	0	100	100	65-100	40-90	20-40	NP-10
Zell-----	0-7	Very fine sandy loam.	ML, CL-ML	A-4	0	100	95-100	85-95	50-70	15-25	NP-7
	7-23	Silt loam, very fine sandy loam, loam.	CL, CL-ML	A-4, A-6	0	100	95-100	85-100	70-100	25-40	5-15
	23-60	Silt loam, very fine sandy loam, loam.	ML, CL-ML	A-4	0	100	95-100	85-100	60-100	15-25	NP-7
EdC----- Edgeley	0-5	Loam-----	CL, CL-ML	A-4, A-6	0-5	95-100	95-100	85-95	60-75	20-40	5-25
	5-30	Clay loam, silty clay loam, silt loam.	CL, CH, MH	A-6, A-7	0-5	80-100	75-100	65-95	55-95	25-75	10-40
	30-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
EgB: Egeland-----	0-8	Sandy loam-----	SM, SC-SM	A-2, A-4	0	100	95-100	75-100	30-50	15-25	NP-7
	8-30	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	15-50	15-25	NP-7
	30-60	Loamy sand, loamy fine sand, loamy very fine sand.	SM, SP-SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	10-45	15-25	NP-5
Embden-----	0-9	Fine sandy loam	SM, ML	A-2, A-4	0	100	100	60-95	30-65	15-35	NP-10
	9-51	Fine sandy loam, sandy loam.	SM	A-2, A-4	0	100	100	60-85	30-50	---	NP
	51-60	Very fine sandy loam, sandy loam, loamy fine sand.	SM	A-2, A-4	0	100	100	50-80	15-50	---	NP

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
En:											
Exline-----	0-2	Silt loam-----	CL	A-6, A-7	0	100	100	95-100	85-100	30-45	10-20
	2-26	Clay, silty clay, silty clay loam.	MH, CH	A-7	0	100	100	95-100	90-100	60-90	30-50
	26-37	Silty clay loam, silty clay, clay.	CH, MH	A-7	0	100	100	95-100	85-100	50-80	20-45
	37-60	Stratified very fine sand to clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
Aberdeen-----	0-12	Silt loam-----	CL, ML	A-6, A-7, A-4	0	100	100	95-100	90-100	30-45	7-20
	12-37	Silty clay, clay, silty clay loam.	ML, MH	A-7	0	100	100	95-100	90-100	45-75	15-40
	37-45	Silty clay loam, silty clay.	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	85-100	35-65	15-30
	45-60	Stratified very fine sand to clay.	ML, CL, CL-ML, CH	A-4, A-6, A-7	0	100	100	95-100	85-100	20-56	3-33
Nahon-----	0-7	Silt loam-----	CL, ML	A-6, A-7	0	100	100	90-100	80-100	30-45	5-20
	7-8	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
	8-25	Silty clay, silty clay loam.	MH, CH, CL, ML	A-7	0	100	100	95-100	90-100	45-65	15-35
	25-40	Silty clay, silty clay loam, silt loam.	CL, CH, MH, ML	A-7, A-6	0	100	100	90-100	80-100	30-65	10-30
	40-60	Stratified very fine sand to clay.	CL, CH, ML, MH	A-7	0	100	100	90-100	75-100	40-70	15-35
Ep:											
Exline-----	0-2	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	25-40	5-15
	2-26	Silty clay, silty clay loam.	CH, MH	A-7	0	100	100	95-100	85-100	50-70	20-40
	26-37	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	11-25
	37-60	Stratified very fine sand to clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
Putney-----	0-8	Silt loam-----	CL, ML	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	5-20
	8-15	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
	15-25	Stratified very fine sand to clay.	CL, ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
	25-60	Stratified very fine sandy loam to silty clay.	CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	5-25

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Fd----- Fordville	0-9	Loam-----	ML, CL	A-4, A-6, A-7	0	100	100	70-85	55-75	30-45	5-20
	9-20	Loam, silt loam, clay loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	70-95	55-80	30-45	5-20
	20-29	Loam, clay loam, fine sandy loam.	CL, ML, SM, SC	A-4, A-6	0	95-100	90-100	65-90	40-55	25-40	3-15
	29-60	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM	A-1	0	65-85	45-70	15-45	0-15	15-25	NP-5
FmA, FmB: Forman-----	0-8	Loam-----	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	60-90	20-40	5-15
	8-15	Clay loam-----	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-80	25-45	5-20
	15-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-80	25-45	5-20
Aastad-----	0-14	Loam-----	ML, CL	A-6, A-7	0-5	95-100	95-100	80-95	50-75	35-45	10-20
	14-29	Clay loam-----	CL	A-7	0-5	95-100	90-100	75-95	50-75	40-50	15-25
	29-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	85-100	75-95	55-75	35-50	12-25
FnB: Forman-----	0-8	Loam-----	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	60-90	20-40	5-15
	8-15	Clay loam-----	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-80	25-45	5-20
	15-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-80	25-45	5-20
Aastad-----	0-14	Loam-----	ML, CL	A-6, A-7	0-5	95-100	95-100	80-95	50-75	35-45	10-20
	14-29	Clay loam-----	CL	A-7	0-5	95-100	90-100	75-95	50-75	40-50	15-25
	29-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	85-100	75-95	55-75	35-50	12-25
Parnell-----	0-17	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	17-38	Clay loam, silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	90-100	70-100	40-80	20-50
	38-60	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	95-100	90-100	80-95	70-95	30-80	15-50
FoB: Forman-----	0-8	Loam-----	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	60-90	20-40	5-15
	8-15	Clay loam-----	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-80	25-45	5-20
	15-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-80	25-45	5-20
Buse-----	0-7	Loam-----	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-22	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	22-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Aastad-----	0-14	Loam-----	ML, CL	A-6, A-7	0-5	95-100	95-100	80-95	50-75	35-45	10-20
	14-29	Clay loam-----	CL	A-7	0-5	95-100	90-100	75-95	50-75	40-50	15-25
	29-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	85-100	75-95	55-75	35-50	12-25

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
FoC:											
Forman-----	0-8	Loam-----	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	60-90	20-40	5-15
	8-15	Clay loam-----	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-80	25-45	5-20
	15-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-80	25-45	5-20
Buse-----	0-7	Loam-----	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-22	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	22-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Aastad-----	0-14	Loam-----	ML, CL	A-6, A-7	0-5	95-100	90-100	80-95	50-75	35-45	10-20
	14-29	Clay loam-----	CL	A-7	0-5	95-100	85-100	75-95	50-75	40-50	15-25
	29-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	85-100	75-95	55-75	35-50	12-25
FpB, FpC:											
Forman-----	0-8	Loam-----	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	60-90	20-40	5-15
	8-15	Clay loam-----	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-80	25-45	5-20
	15-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-80	25-45	5-20
Buse-----	0-7	Loam-----	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-22	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	22-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Parnell-----	0-17	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	17-38	Clay loam, silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	90-100	70-100	40-80	20-50
	38-60	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	95-100	90-100	80-95	70-95	30-80	15-50
Gb----- Great Bend	0-7	Silt loam-----	CL, ML	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	5-20
	7-17	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	17-39	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	39-52	Stratified silt loam to silty clay loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	52-60	Stratified very fine sand to clay.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	3-25

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Gp: Great Bend-----	0-7	Silt loam-----	CL, ML	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	5-20
	7-17	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	17-39	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	39-52	Stratified silt loam to silty clay loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	52-60	Stratified very fine sand to clay.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	3-25
Putney-----	0-8	Silt loam-----	CL, ML	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	5-20
	8-15	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
	15-25	Stratified very fine sand to clay.	CL, ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
	25-60	Stratified very fine sandy loam to silty clay.	CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	5-25
GzC: Great Bend-----	0-7	Silt loam-----	CL, ML	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	5-20
	7-17	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	17-39	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	39-52	Stratified silt loam to silty clay loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	52-60	Stratified very fine sand to clay.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	3-25
Zell-----	0-7	Silt loam-----	CL, ML	A-4, A-6	0	100	95-100	90-100	80-100	30-40	5-15
	7-23	Silt loam, very fine sandy loam, loam.	CL, CL-ML	A-4, A-6	0	100	95-100	85-100	70-100	25-40	5-15
	23-60	Silt loam, very fine sandy loam, loam.	ML, CL-ML	A-4	0	100	95-100	85-100	60-100	15-25	NP-7
Huffton-----	0-7	Silt loam-----	CL, ML	A-4, A-6	0	100	100	85-100	80-100	30-40	5-15
	7-25	Silt loam, loam, very fine sandy loam.	CL, CL-ML	A-4, A-6	0	100	100	85-100	80-100	25-40	5-15
	25-60	Silt loam, loam, very fine sandy loam.	CL, CL-ML	A-4, A-6	0	100	100	85-100	80-100	25-40	5-15
HaA, HaB----- Hamerly	0-11	Loam-----	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	80-95	60-90	20-40	5-20
	11-28	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-75	20-45	5-25
	28-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	75-95	55-75	20-45	5-25

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Hb:											
Hamerly-----	0-11	Loam-----	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	80-95	60-90	20-40	5-20
	11-28	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-75	20-45	5-25
	28-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	75-95	55-75	20-45	5-25
Parnell-----	0-17	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	17-38	Clay loam, silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	90-100	70-100	40-80	20-50
	38-60	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	95-100	90-100	80-95	70-95	30-80	15-50
Hd:											
Harmony-----	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
	10-26	Silty clay, silty clay loam.	CL, CH, MH, ML	A-7	0	100	100	95-100	90-100	40-65	15-32
	26-60	Stratified very fine sand to clay.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	5-20
Aberdeen-----	0-12	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
	12-37	Silty clay, clay, silty clay loam.	ML, MH	A-7	0	100	100	95-100	90-100	45-75	15-40
	37-45	Silty clay loam, silty clay.	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	85-100	35-65	15-30
	45-60	Stratified very fine sand to clay.	ML, CL, CL-ML, CH	A-4, A-6, A-7	0	100	100	95-100	85-100	20-56	3-33
Hm:											
Harmony-----	0-10	Silt loam-----	ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-20
	10-26	Silty clay, silty clay loam.	CL, CH, MH, ML	A-7	0	100	100	95-100	90-100	40-65	15-32
	26-60	Stratified very fine sand to clay.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	5-20
Beotia-----	0-10	Silt loam-----	CL, ML	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	5-20
	10-24	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	100	100	95-100	90-100	32-50	10-20
	24-35	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	90-100	25-50	5-20
	35-60	Stratified very fine sand to clay.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	90-100	25-50	5-20
Hr-----											
Harriet	0-1	Loam-----	CL, CL-ML	A-4, A-6	0	100	100	85-95	60-80	25-45	5-20
	1-16	Clay loam, silty clay loam, silty clay.	CL, CH	A-7, A-6	0	100	100	90-100	70-100	35-70	20-40
	16-60	Loam, silty clay loam, clay loam.	CL, CH	A-6	0	100	100	90-100	60-100	25-55	10-30

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
HtA----- Hetland	0-9	Silty clay loam	CL, CH	A-7	0	100	100	95-100	90-100	45-60	20-35
	9-29	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	90-100	40-60	20-35
	29-37	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	90-100	40-60	15-30
	37-60	Stratified very fine sandy loam to silty clay loam.	CL, CH	A-6, A-7	0	100	95-100	95-100	85-100	35-55	11-30
HuB: Hetland-----	0-9	Silty clay loam	CL, CH	A-7	0	100	100	95-100	90-100	45-60	20-35
	9-29	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	90-100	40-60	20-35
	29-37	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	90-100	40-60	15-30
	37-60	Stratified very fine sandy loam to silty clay loam.	CL, CH	A-6, A-7	0	100	95-100	95-100	85-100	35-55	11-30
Rusklyn-----	0-9	Silty clay loam	CL	A-6, A-7	0-5	100	95-100	95-100	85-100	30-50	10-25
	9-28	Silty clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0-5	100	95-100	95-100	85-100	30-45	5-20
	28-53	Silty clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0-5	100	95-100	95-100	85-100	30-45	5-20
	53-60	Clay loam, loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-80	25-45	5-20
KbE: Kloten-----	0-6	Silt loam-----	CL, CL-ML	A-4, A-6	0-10	90-100	90-100	85-95	60-90	20-40	5-20
	6-14	Loam, silty clay loam, clay loam.	CL-ML, CL	A-4, A-6	0-10	90-100	80-100	70-95	60-90	20-40	5-20
	14-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Buse-----	0-7	Loam-----	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-22	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	22-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
KrB: Kranzburg-----	0-9	Silt loam-----	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-45	10-20
	9-27	Silty clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	15-30
	27-39	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
	39-60	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
Brookings-----	0-13	Silt loam-----	CL, ML	A-6, A-4	0	100	100	95-100	85-100	30-40	7-15
	13-27	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	27-60	Loam, clay loam	CL	A-6, A-7	0	100	95-100	85-100	70-85	35-50	15-25
Buse-----	0-7	Loam-----	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-22	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	22-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ks:											
Kranzburg-----	0-9	Silt loam-----	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-45	10-20
	9-27	Silty clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	15-30
	27-39	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
	39-60	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
Brookings-----	0-13	Silt loam-----	CL, ML	A-6, A-4	0	100	100	95-100	85-100	30-40	7-15
	13-27	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	27-60	Loam, clay loam	CL	A-6, A-7	0	100	95-100	85-100	70-85	35-50	15-25
KtB:											
Kranzburg-----	0-9	Silty clay loam	CL, CH	A-7	0	100	100	95-100	90-100	40-55	15-30
	9-23	Silty clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	15-30
	23-36	Silty clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	15-30
	36-43	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
	43-60	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
Forman-----	0-8	Loam-----	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	60-90	20-40	5-15
	8-15	Clay loam-----	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-80	25-45	5-20
	15-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-80	25-45	5-20
La-----											
La Prairie	0-16	Loam-----	CL-ML, CL	A-4, A-6	0	100	100	85-95	70-80	25-40	5-15
	16-31	Silt loam, loam, clay loam.	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	50-90	25-50	5-25
	31-60	Silt loam, loam, clay loam.	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	70-95	25-50	5-25
Lh:											
La Prairie-----	0-16	Loam-----	CL-ML, CL	A-4, A-6	0	100	100	85-95	70-80	25-40	5-15
	16-31	Silt loam, loam, clay loam.	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	50-90	25-50	5-25
	31-60	Silt loam, loam, clay loam.	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	70-90	25-50	5-25
Holmquist-----	0-8	Loam-----	CL	A-6	0	100	95-100	85-95	55-80	30-40	10-15
	8-60	Stratified fine sandy loam to clay loam.	CL-ML, CL	A-6, A-7, A-4	0	100	95-100	75-95	50-80	25-45	5-20
Lm-----											
Lamoure	0-28	Silty clay loam	CL, CH, MH, ML	A-7	0	100	100	95-100	85-100	45-70	20-35
	28-56	Silty clay loam, silt loam.	CL, CH, MH, ML	A-7	0	100	100	90-100	85-100	40-70	15-35
	56-60	Stratified sandy loam to silty clay loam.	CL, SC	A-6, A-7	0	95-100	95-100	70-95	35-90	30-50	10-25
Lo-----											
Lowe	0-8	Loam-----	ML, CL	A-4, A-6, A-7	0	100	100	90-100	60-75	30-45	5-20
	8-34	Clay loam, loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	60-85	35-50	11-25
	34-60	Stratified silty clay loam to loamy sand.	ML, CL, SM, SC	A-4, A-6, A-7	0	100	100	85-100	45-75	30-45	5-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Lu, Lw----- Ludden	0-7	Silty clay-----	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
	7-31	Silty clay, clay	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
	31-60	Silty clay, clay, clay loam.	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
Lx: Ludden-----	0-7	Silty clay-----	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
	7-31	Silty clay, clay	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
	31-60	Silty clay, clay, clay loam.	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
Ludden, saline--	0-7	Silty clay-----	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
	7-31	Silty clay, clay	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
	31-60	Silty clay, clay, clay loam.	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
MaA, MaB, MaC: Maddock-----	0-9	Sandy loam-----	SM	A-2, A-4	0	100	100	60-85	30-50	---	NP
	9-60	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM	A-2, A-3	0	95-100	95-100	60-100	5-35	---	NP
Egeland-----	0-8	Sandy loam-----	SM, SC-SM	A-2, A-4	0	100	95-100	75-100	30-50	15-25	NP-7
	8-30	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	15-50	15-25	NP-7
	30-60	Loamy sand, loamy fine sand, loamy very fine sand.	SM, SP-SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	10-45	15-25	NP-5
Md: Marysland-----	0-14	Loam-----	CL	A-6, A-7	0	95-100	95-100	85-95	50-80	30-50	10-25
	14-30	Loam, clay loam, sandy clay loam.	CL, SC	A-6	0	90-100	85-100	80-95	45-80	20-40	10-20
	30-60	Stratified fine sand to gravelly coarse sand.	SP-SM, SM	A-1, A-2, A-3	0	70-95	50-90	35-70	5-20	---	NP
Divide-----	0-9	Loam-----	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-95	60-85	25-40	5-20
	9-25	Loam, clay loam, gravelly loam.	CL, CL-ML, SC-SM, SC	A-4, A-6, A-7	0-3	95-100	75-100	55-90	35-80	20-45	5-20
	25-60	Stratified sand to gravelly sand.	GM, SM, GP-GM, SP-SM	A-1, A-3, A-2-4	0-5	25-100	15-100	10-70	5-25	0-30	NP-5
MfB----- Mauvais	0-4	Clay loam-----	CL, CL-ML	A-6, A-4	0-5	90-100	85-100	85-100	60-90	25-40	5-20
	4-60	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0-5	90-100	85-100	75-95	55-80	25-45	5-25
MgB----- Mauvais	0-4	Clay loam-----	CL, CH	A-6, A-7	5-49	90-100	85-100	85-100	70-80	35-55	12-30
	4-60	Clay loam-----	CH, CL	A-7	0-20	90-100	85-100	85-100	70-95	40-65	15-30
MnA----- Minnewasta	0-4	Sandy loam-----	SM, SC-SM	A-4, A-2	0-5	100	100	80-100	20-55	10-28	NP-10
	4-16	Coarse sand, loamy fine sand, sand.	SP, SM, SC, CL	A-1, A-2	0-5	60-95	50-90	20-60	0-55	0-20	NP-10
	16-60	Clay loam, loam, sandy clay loam.	CL, CL-ML	A-7, A-4, A-6	0-5	100	95-100	90-100	70-95	25-45	5-25

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	<u>In</u>				<u>Pct</u>					<u>Pct</u>	
MoB----- Minnewasta	0-4	Sandy loam-----	SM, SC-SM	A-4, A-2	5-49	90-100	85-100	75-100	20-55	20-30	NP-10
	4-16	Coarse sand, loamy fine sand, sand.	SP, SM, SC	A-1, A-2	0-20	60-95	50-90	20-60	0-55	0-20	NP-10
	16-60	Clay loam, loam, sandy clay loam.	CL, CL-ML	A-7, A-4, A-6	0-20	90-100	85-100	85-100	70-95	25-45	5-25
Mw----- Minnewaukan	0-4	Loamy sand-----	SM	A-2	0	90-100	70-100	50-85	15-30	---	NP
	4-60	Loamy coarse sand, loamy sand, sand.	SM, SP-SM	A-2, A-3	0	90-100	70-100	50-100	5-35	---	NP
Na: Nahon-----	0-7	Silt loam-----	CL, ML	A-6, A-7	0	100	100	90-100	80-100	30-45	5-20
	7-8	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
	8-25	Silty clay, silty clay loam.	MH, CH, CL, ML	A-7	0	100	100	95-100	90-100	45-65	15-35
	25-40	Silty clay, silty clay loam, silt loam.	CL, CH, MH, ML	A-7, A-6	0	100	100	90-100	80-100	30-65	10-30
	40-60	Stratified very fine sand to clay.	CL, CH, ML, MH	A-7	0	100	100	90-100	75-100	40-70	15-35
Aberdeen-----	0-12	Silt loam-----	CL, ML	A-6, A-7, A-4	0	100	100	95-100	90-100	30-45	7-20
	12-37	Silty clay, clay, silty clay loam.	ML, MH	A-7	0	100	100	95-100	90-100	45-75	15-40
	37-45	Silty clay loam, silty clay.	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	85-100	35-65	15-30
	45-60	Stratified very fine sand to clay.	ML, CL, CL-ML, CH	A-4, A-6, A-7	0	100	100	95-100	85-100	20-56	3-33
Exline-----	0-2	Silt loam-----	CL	A-6, A-7	0	100	100	95-100	85-100	30-45	10-20
	2-26	Clay, silty clay, silty clay loam.	MH, CH	A-7	0	100	100	95-100	90-100	60-90	30-50
	26-37	Silty clay loam, silty clay, clay.	CH, MH	A-7	0	100	100	95-100	85-100	50-80	20-45
	37-60	Stratified very fine sand to clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
NaB: Nutley-----	0-7	Silty clay-----	CH	A-7	0	100	100	95-100	85-100	50-75	25-50
	7-60	Clay, silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	85-100	50-80	25-50
Sinai-----	0-12	Silty clay-----	CL, CH, MH, ML	A-7	0	100	100	95-100	90-100	45-70	20-35
	12-23	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	90-100	60-90	25-55
	23-42	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	90-100	60-90	25-55
	42-60	Stratified silty clay to silt loam.	CL, CH	A-7	0	100	100	95-100	80-95	40-65	15-35

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Oh----- Oldham	0-8	Silty clay loam	CL, CH, MH, ML	A-7	0	100	95-100	90-100	85-100	40-60	15-25
	8-47	Silty clay loam, clay loam, silty clay.	CL, CH, MH, ML	A-7	0	100	95-100	85-100	85-100	40-60	15-25
	47-60	Silty clay loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	95-100	85-100	70-100	25-45	5-20
Or----- Orthents	0-10	Gravelly loam-----	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	10-60	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM	A-1	0-10	60-85	45-70	15-45	0-15	15-25	NP-5
Pa----- Parnell	0-17	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	17-38	Clay loam, silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	90-100	70-100	40-80	20-50
	38-60	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	95-100	90-100	80-95	70-95	30-80	15-50
Pc----- Playmoor	0-8	Silty clay loam	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	80-100	35-60	12-25
	8-25	Silt loam, silty clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	80-100	35-60	12-25
	25-36	Silt loam, silty clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	85-100	35-60	12-25
	36-60	Stratified loamy sand to silty clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	70-100	35-60	12-25
Pm: Playmoor-----	0-8	Silty clay loam	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	80-100	35-60	12-25
	8-25	Silt loam, silty clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	80-100	35-60	12-25
	25-36	Silt loam, silty clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	85-100	35-60	12-25
	36-60	Stratified loamy sand to silty clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	70-100	35-60	12-25
Lamoure-----	0-28	Silty clay loam	CL, CH, MH, ML	A-7	0	100	100	95-100	85-100	40-70	15-35
	28-56	Silty clay loam, silt loam.	CL, CH, MH, ML	A-7	0	100	100	90-100	60-100	40-70	15-35
	56-60	Stratified sandy loam to silty clay loam.	CL, SC	A-6, A-7	0	95-100	95-100	70-95	35-90	30-70	10-35
PrC: Poinsett-----	0-7	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	7-16	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	16-39	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	39-60	Clay loam-----	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
PrC:											
Rusklyn-----	0-9	Silty clay loam	CL	A-6, A-7	0-5	100	95-100	95-100	85-100	30-50	10-25
	9-28	Silty clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0-5	100	95-100	95-100	85-100	30-45	5-20
	28-53	Silty clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0-5	100	95-100	95-100	85-100	30-45	5-20
	53-60	Clay loam, loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-80	25-45	5-20
PsB:											
Poinsett-----	0-7	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	7-16	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	16-39	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	39-60	Clay loam-----	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
Rusklyn-----	0-9	Silty clay loam	CL	A-6, A-7	0-5	100	95-100	95-100	85-100	30-50	10-25
	9-28	Silty clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0-5	100	95-100	95-100	85-100	30-45	5-20
	28-53	Silty clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0-5	100	95-100	95-100	85-100	30-45	5-20
	53-60	Clay loam, loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-80	25-45	5-20
Waubay-----	0-12	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	12-23	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	23-36	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	36-60	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-95	30-45	5-20
PwA, PwB:											
Poinsett-----	0-7	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	7-16	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	16-39	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	39-60	Clay loam-----	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
Waubay-----	0-12	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	12-23	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	23-36	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	36-60	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-95	30-45	5-20
Ra:											
Ranslo-----	0-8	Loam-----	CL, CL-ML, ML	A-4, A-6	0	100	100	85-100	65-80	25-38	3-15
	8-37	Silty clay, silty clay loam, clay loam.	CH, CL	A-7	0	100	100	95-100	75-90	40-60	20-35
	37-60	Clay loam, silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	75-95	50-75	23-42

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	<u>In</u>				<u>Pct</u>					<u>Pct</u>	
Ra:											
Harriet-----	0-1	Loam-----	CL, CL-ML	A-4, A-6	0	100	100	85-95	60-80	25-45	5-20
	1-16	Clay loam, silty clay loam, silty clay.	CL, CH	A-7, A-6	0	100	100	90-100	70-100	35-70	20-40
	16-60	Loam, silty clay loam, clay loam.	CL, CH	A-6	0	100	100	90-100	60-100	25-55	10-30
Rb:											
Rauville-----	0-32	Silty clay loam	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	85-100	35-60	15-28
	32-52	Silty clay loam, silt loam, silty clay.	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	85-100	35-60	15-28
	52-60	Stratified gravelly sand to clay loam.	SM, SC, CL, ML	A-2, A-4	0	80-100	65-95	50-85	15-70	15-30	NP-10
RfA, RfB:											
Renshaw-----	0-7	Loam-----	ML, CL	A-4, A-6	0-5	95-100	90-100	70-100	50-75	30-40	5-15
	7-18	Loam, sandy clay loam, gravelly loam.	SC-SM, SC, ML, CL	A-4, A-6	0-5	95-100	55-100	45-90	35-70	20-40	3-15
	18-60	Gravelly loamy sand, very gravelly sand, gravelly sand.	SW, SM, SW-SM, GW-GM	A-1, A-2	0-5	45-95	30-80	10-60	0-15	0-25	NP-5
Fordville-----	0-9	Loam-----	ML, CL	A-4, A-6, A-7	0	100	100	70-85	55-75	30-45	5-20
	9-20	Loam, silt loam, clay loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	70-95	55-80	30-45	5-20
	20-29	Loam, clay loam, fine sandy loam.	CL, ML, SM, SC	A-4, A-6	0	95-100	90-100	65-90	40-55	25-40	3-15
	29-60	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM	A-1	0	65-85	45-70	15-45	0-15	15-25	NP-5
RsA:											
Renshaw-----	0-7	Loam-----	ML, CL	A-4, A-6	0-5	95-100	90-100	70-100	50-75	30-40	5-15
	7-18	Loam, sandy clay loam, gravelly loam.	SC-SM, SC, ML, CL	A-4, A-6	0-5	95-100	55-100	45-90	35-70	20-40	3-15
	18-60	Gravelly loamy sand, very gravelly sand, gravelly sand.	SW, SM, SW-SM, GW-GM	A-1, A-2	0-5	45-95	30-80	10-60	0-15	0-25	NP-5
Sioux-----	0-7	Loam-----	ML, CL	A-4, A-6	0-5	95-100	85-100	70-90	55-75	30-40	5-15
	7-11	Gravelly loam, gravelly sandy loam, gravelly loamy sand.	SM, GM	A-4, A-2, A-1	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	11-60	Extremely gravelly sand, very gravelly loamy sand, very gravelly sand.	GM, GP, SM, SP	A-1	0-5	25-75	20-60	5-35	0-25	0-25	NP-5

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
RsB: Renshaw-----	0-7	Loam-----	ML, CL	A-4, A-6	0-5	95-100	90-100	70-100	50-75	30-40	5-15
	7-18	Loam, sandy clay loam, gravelly loam.	SC-SM, SC, ML, CL	A-4, A-6	0-5	95-100	55-100	45-90	35-70	20-40	3-15
	18-60	Gravelly loamy sand, very gravelly sand, gravelly sand.	SW, SM, SW-SM, GW-GM	A-1, A-2	0-5	45-95	30-80	10-60	0-15	0-25	NP-5
Sioux-----	0-6	Gravelly loam----	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	6-9	Gravelly loam, gravelly sandy loam, gravelly loamy sand.	SM, GM	A-4, A-2, A-1	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	9-60	Extremely gravelly sand, very gravelly loamy sand, very gravelly sand.	GM, GP, SM, SP	A-1	0-5	25-75	20-60	5-35	0-25	0-25	NP-5
Ru: Ryan-----	0-5	Silty clay loam	CH	A-7	0	100	100	95-100	85-95	50-75	25-50
	5-60	Silty clay, clay	CH	A-7	0	100	100	90-100	75-100	50-75	25-50
Ludden-----	0-7	Silty clay-----	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
	7-31	Silty clay, clay	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
	31-60	Silty clay, clay, clay loam.	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
SaA: Sinai-----	0-12	Silty clay-----	CL, CH, MH, ML	A-7	0	100	100	95-100	90-100	45-70	20-35
	12-23	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	90-100	60-90	25-55
	23-42	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	90-100	60-90	25-55
	42-60	Stratified silty clay to silt loam.	CL, CH	A-7	0	100	100	95-100	80-95	40-65	15-35
Nutley-----	0-7	Silty clay-----	CH	A-7	0	100	100	95-100	85-100	50-75	25-50
	7-60	Clay, silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	85-100	50-80	25-50
SbB----- Sioux	0-6	Gravelly loamy sand.	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	6-9	Gravelly loam, gravelly sandy loam, gravelly loamy sand.	SM, GM	A-4, A-2, A-1	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	9-60	Extremely gravelly sand, very gravelly loamy sand, very gravelly sand.	GM, GP, SM, SP	A-1	0-5	25-75	20-60	5-35	0-25	0-25	NP-5

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
SoB----- Sioux	0-6	Gravelly loamy coarse sand.	SM, SP-SM, SC-SM	A-1, A-2, A-4	15-75	75-100	70-90	25-80	10-40	0-25	NP-7
	6-9	Very stony sandy loam, very stony loamy sand, sandy loam.	SM, SC-SM	A-4, A-2, A-1	15-50	70-90	70-85	45-70	15-40	0-25	NP-7
	9-60	Extremely gravelly sand, very gravelly loamy sand, very gravelly sand.	GM, GP, SM, SP	A-1	0-15	25-75	10-60	5-35	0-25	0-25	NP-5
SrD, SrE: Sioux-----	0-6	Gravelly loam----	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	6-9	Gravelly loam, gravelly sandy loam, gravelly loamy sand.	SM, GM	A-4, A-2, A-1	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	9-60	Extremely gravelly sand, very gravelly loamy sand, very gravelly sand.	GM, GP, SM, SP	A-1	0-5	25-75	20-60	5-35	0-25	0-25	NP-5
Renshaw-----	0-7	Loam-----	ML, CL	A-4, A-6	0-5	95-100	90-100	70-100	50-75	30-40	5-15
	7-18	Loam, sandy clay loam, gravelly loam.	SC-SM, SC, ML, CL	A-4, A-6	0-5	95-100	55-100	45-90	35-70	20-40	3-15
	18-60	Gravelly loamy sand, very gravelly sand, gravelly sand.	SW, SM, SW-SM, GW-GM	A-1, A-2	0-5	45-95	30-80	10-60	0-15	0-25	NP-5
SsE: Sioux-----	0-6	Very stony loam	ML, CL, SM, SC	A-4, A-6	15-75	75-100	70-90	50-85	35-70	30-40	5-15
	6-9	Gravelly loam, very stony loamy sand, extremely stony sandy loam.	SM, SC-SM	A-4, A-2, A-1	15-50	70-90	70-85	45-70	15-40	0-25	NP-7
	9-60	Extremely gravelly sand, very gravelly loamy sand, very gravelly sand.	GM, GP, SM, SP	A-1	0-15	25-75	10-60	5-35	0-25	0-25	NP-5
Renshaw-----	0-7	Loam-----	SC, SC-SM	A-4, A-6	5-35	90-100	55-70	40-65	35-50	25-35	5-15
	7-18	Loam, sandy clay loam, gravelly loam.	SC-SM, SC, ML, CL	A-4, A-6	0-5	95-100	55-100	45-90	35-70	25-37	3-15
	18-60	Gravelly sand, very gravelly sand.	SW, SM, GW, GW-GM	A-1, A-2, A-3	0-5	45-95	40-70	10-60	0-15	0-25	NP-5
Sw----- Southam	0-7	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	80-100	30-50	10-25
	7-51	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	95-100	90-100	85-100	40-75	15-50
	51-60	Silty clay, silty clay loam, loam.	CL, CH, CL-ML	A-6, A-7, A-4	0	100	95-100	85-100	60-100	20-75	5-50

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
To----- Tonka	0-17	Silt loam-----	CL, CL-ML	A-4, A-6	0-2	100	95-100	90-100	70-90	20-35	5-15
	17-42	Silty clay loam, clay loam, clay.	CH, CL	A-6, A-7	0-2	100	95-100	90-100	75-95	35-55	15-35
	42-60	Silty clay loam, clay loam, loam.	CL, CL-ML	A-6, A-7, A-4	0-3	90-100	85-100	60-100	50-90	25-50	5-30
Va----- Vallars	0-11	Loam-----	ML	A-4	0-5	95-100	90-100	80-90	65-80	25-40	3-10
	11-26	Clay loam, silty clay loam, loam.	CL	A-6	0-5	95-100	90-100	80-95	50-80	30-40	10-20
	26-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-95	60-75	20-40	5-20
Vh: Vallars-----	0-11	Loam-----	OL, ML	A-4	0	95-100	90-100	80-90	50-80	30-40	4-10
	11-18	Clay loam, silty clay loam, sandy clay loam.	CL	A-6	0	95-100	90-100	80-95	50-80	30-40	11-20
	18-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	95-100	90-100	85-95	60-85	20-40	5-20
Hamerly-----	0-11	Loam-----	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	80-95	60-90	20-40	5-20
	11-28	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-75	20-45	5-25
	28-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	75-95	55-75	20-45	5-25
VoA, VoB: Vienna-----	0-8	Silt loam-----	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	8-17	Silty clay loam, silt loam.	ML, CL	A-6, A-7	0	100	95-100	90-100	85-100	35-50	10-25
	17-35	Clay loam, loam	CL	A-6, A-7	0-5	95-100	90-100	85-100	60-85	30-45	10-20
	35-60	Clay loam, loam	CL	A-6	0-5	90-100	85-100	80-100	55-80	30-40	10-20
Brookings-----	0-13	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	13-27	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	27-60	Loam, clay loam	CL	A-6, A-7	0	100	95-100	85-100	70-85	35-50	15-25

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodi- bility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Aa----- Aastad	0-14	24-27	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.8	0-0	Moderate	0.24	5	6	4-6
	14-29	28-35	1.45-1.60	0.2-0.6	0.15-0.19	6.6-7.8	0-0	Moderate	0.28			
	29-60	24-35	1.55-1.65	0.2-0.6	0.14-0.16	7.4-8.4	0-0	Moderate	0.37			
An: Aberdeen-----	0-12	27-33	1.15-1.25	0.2-0.6	0.19-0.22	5.6-7.3	0-2	Moderate	0.37	5	7	3-6
	12-37	35-55	1.20-1.35	0.06-0.2	0.13-0.18	6.6-8.4	0-4	High-----	0.37			
	37-45	30-55	1.20-1.35	0.06-0.2	0.14-0.17	7.4-9.0	2-8	High-----	0.37			
	45-60	10-26	1.25-1.40	0.06-2.0	0.14-0.17	7.4-9.0	2-8	Low-----	0.43			
Nahon-----	0-7	27-30	1.15-1.25	0.2-0.6	0.19-0.22	5.6-7.3	0-2	Moderate	0.37	2	7	2-6
	7-8	20-30	1.20-1.35	0.2-0.6	0.19-0.22	5.6-7.3	0-2	Moderate	0.37			
	8-25	35-55	1.25-1.45	0.01-0.06	0.10-0.15	6.6-9.0	0-2	High-----	0.37			
	25-40	23-55	1.20-1.35	0.06-0.2	0.11-0.19	7.4-9.0	4-16	High-----	0.37			
	40-60	30-60	1.05-1.35	0.01-0.6	0.14-0.17	7.9-9.0	4-16	Moderate	0.43			
Aq----- Aquents	0-2	18-27	1.10-1.40	0.6-2.0	0.17-0.22	7.4-9.0	8-16	Moderate	0.37	5	4L	1-3
	2-60	18-27	1.20-1.35	0.06-2.0	0.17-0.20	7.9-9.0	8-16	Moderate	0.43			
ArB----- Arvilla	0-8	6-18	1.40-1.60	2.0-6.0	0.13-0.15	6.1-8.4	0-0	Low-----	0.20	3	3	1-4
	8-19	6-18	1.40-1.60	2.0-6.0	0.11-0.14	6.6-8.4	0-0	Low-----	0.20			
	19-60	2-10	1.40-1.60	6.0-100	0.02-0.05	7.4-8.4	0-0	Low-----	0.10			
Ba----- Bearden	0-8	10-26	1.20-1.40	0.6-2.0	0.20-0.24	7.4-8.4	0-4	Moderate	0.32	5	4L	3-7
	8-26	18-34	1.30-1.50	0.2-2.0	0.16-0.22	7.4-8.4	0-4	Moderate	0.37			
	26-39	18-34	1.30-1.80	0.2-2.0	0.16-0.22	7.4-8.4	0-4	Moderate	0.43			
	39-60	18-59	1.30-1.80	0.06-2.0	0.16-0.22	7.4-8.4	0-8	Moderate	0.43			
BaB: Bearden-----	0-8	10-26	1.20-1.40	0.6-2.0	0.20-0.24	7.4-8.4	0-4	Moderate	0.32	5	4L	3-7
	8-26	18-34	1.30-1.50	0.2-2.0	0.16-0.22	7.4-8.4	0-4	Moderate	0.37			
	26-39	18-34	1.30-1.80	0.2-2.0	0.16-0.22	7.4-8.4	0-4	Moderate	0.43			
	39-60	18-59	1.30-1.80	0.06-2.0	0.16-0.22	7.4-8.4	0-8	Moderate	0.43			
Huffton-----	0-7	10-18	1.15-1.30	0.6-2.0	0.20-0.22	6.6-8.4	0-2	Low-----	0.37	5	4L	1-4
	7-25	15-30	1.20-1.35	0.6-2.0	0.12-0.17	7.4-9.0	4-16	Moderate	0.37			
	25-60	10-25	1.20-1.35	0.06-2.0	0.15-0.20	7.9-9.0	4-8	Low-----	0.43			
BhA----- Beotia	0-10	20-27	1.10-1.25	0.6-2.0	0.19-0.22	6.1-7.8	0-2	Low-----	0.37	5	6	4-8
	10-24	18-30	1.15-1.30	0.6-2.0	0.19-0.22	6.1-7.8	0-2	Moderate	0.37			
	24-35	18-30	1.20-1.35	0.2-2.0	0.17-0.20	7.4-8.4	0-4	Moderate	0.37			
	35-60	18-35	1.20-1.35	0.06-2.0	0.17-0.20	7.4-8.4	0-8	Moderate	0.43			
Bc: Beotia-----	0-10	20-27	1.10-1.25	0.6-2.0	0.19-0.22	6.1-7.8	0-2	Low-----	0.37	5	6	4-8
	10-24	18-30	1.15-1.30	0.6-2.0	0.19-0.22	6.1-7.8	0-2	Moderate	0.37			
	24-35	18-30	1.20-1.35	0.2-2.0	0.17-0.20	7.4-8.4	0-4	Moderate	0.37			
	35-60	18-35	1.20-1.35	0.06-2.0	0.17-0.20	7.4-8.4	0-8	Moderate	0.43			
Rondell-----	0-12	18-26	1.10-1.25	0.6-2.0	0.19-0.22	6.6-8.4	0-2	Moderate	0.28	5	4L	3-6
	12-31	19-34	1.15-1.30	0.6-2.0	0.14-0.17	7.4-9.0	0-2	Moderate	0.43			
	31-60	19-30	1.20-1.40	0.06-2.0	0.14-0.17	7.4-8.4	0-4	Low-----	0.43			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodi- bility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
BnD:												
Buse-----	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	---	Low-----	0.28	5	4L	1-3
	7-22	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	---	Moderate	0.37			
	22-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	---	Moderate	0.37			
Barnes-----	0-6	10-25	1.20-1.60	0.6-2.0	0.13-0.24	5.6-7.8	0-2	Low-----	0.24	5	6	3-7
	6-13	18-35	1.20-1.60	0.6-2.0	0.15-0.19	6.1-7.8	0-4	Moderate	0.28			
	13-32	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
	32-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
BoE:												
Buse-----	0-7	20-27	1.40-1.50	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Moderate	0.20	5	8	2-4
	7-22	20-30	1.55-1.65	0.2-0.6	0.16-0.20	7.4-8.4	2-8	Moderate	0.28			
	22-60	20-30	1.55-1.65	0.2-0.6	0.16-0.20	7.4-8.4	2-8	Moderate	0.28			
Barnes-----	0-6	18-26	1.20-1.60	0.6-2.0	0.20-0.22	5.6-7.8	0-2	Low-----	0.17	5	8	3-7
	6-13	18-35	1.20-1.60	0.6-2.0	0.15-0.19	6.1-7.8	0-4	Low-----	0.28			
	13-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Low-----	0.37			
BpE:												
Buse-----	0-7	20-27	1.40-1.50	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Moderate	0.20	5	8	2-4
	7-22	20-30	1.55-1.65	0.2-0.6	0.16-0.20	7.4-8.4	2-8	Moderate	0.28			
	22-60	20-30	1.55-1.65	0.2-0.6	0.16-0.20	7.4-8.4	2-8	Moderate	0.28			
Barnes-----	0-6	18-26	1.20-1.60	0.6-2.0	0.20-0.22	5.6-7.8	0-2	Low-----	0.17	5	8	3-7
	6-13	18-35	1.20-1.60	0.6-2.0	0.15-0.19	6.1-7.8	0-4	Low-----	0.28			
	13-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Low-----	0.37			
Parnell-----	0-17	27-40	1.20-1.30	0.2-0.6	0.18-0.22	6.1-7.8	0-2	Moderate	0.37	5	7	6-10
	17-38	35-60	1.20-1.30	0.06-0.2	0.13-0.19	6.1-7.8	0-2	High-----	0.37			
	38-60	35-45	1.20-1.40	0.06-0.2	0.11-0.19	6.6-8.4	0-2	High-----	0.43			
BrE:												
Buse-----	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	---	Low-----	0.28	5	4L	1-3
	7-22	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	---	Moderate	0.37			
	22-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	---	Moderate	0.37			
Langhei-----	0-4	28-35	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	0-0	Low-----	0.28	5	4L	.5-3
	4-19	28-35	1.50-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Low-----	0.32			
	19-60	28-35	1.50-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Low-----	0.32			
BsE:												
Buse-----	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	---	Low-----	0.28	5	4L	1-3
	7-22	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	---	Moderate	0.37			
	22-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	---	Moderate	0.37			
La Prairie-----	0-16	18-27	1.10-1.40	0.6-2.0	0.17-0.22	6.6-8.4	0-0	Low-----	0.24	5	6	2-6
	16-31	18-35	1.10-1.50	0.6-2.0	0.17-0.22	6.6-8.4	0-0	Moderate	0.32			
	31-60	18-35	1.30-1.70	0.6-2.0	0.15-0.22	6.6-8.4	0-0	Moderate	0.32			
Barnes-----	0-6	10-25	1.20-1.60	0.6-2.0	0.13-0.24	5.6-7.8	0-2	Low-----	0.24	5	6	3-7
	6-13	18-35	1.20-1.60	0.6-2.0	0.15-0.19	6.1-7.8	0-4	Moderate	0.28			
	13-32	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
	32-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
BxE:												
Buse-----	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	---	Low-----	0.28	5	4L	1-3
	7-22	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	---	Moderate	0.37			
	22-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	---	Moderate	0.37			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodi- bility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
BxE:												
Sioux-----	0-6	10-20	1.30-1.50	2.0-6.0	0.10-0.15	6.6-8.4	0-2	Low-----	0.15	2	5	1-3
	6-9	10-20	1.20-1.50	2.0-6.0	0.10-0.15	7.4-8.4	0-2	Low-----	0.15			
	9-60	0-10	1.60-1.70	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-----	0.10			
Ca:												
Cavour-----	0-7	18-25	1.10-1.25	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-----	0.32	2	6	4-6
	7-19	35-50	1.25-1.40	0.06-0.2	0.10-0.16	6.6-9.0	4-16	High-----	0.28			
	19-31	25-50	1.24-1.50	0.01-0.2	0.10-0.16	7.4-9.0	8-16	High-----	0.37			
	31-60	25-35	1.50-1.75	0.01-0.6	0.11-0.15	7.4-9.0	8-16	Moderate	0.37			
Ferney-----	0-4	18-26	1.15-1.30	0.6-2.0	0.18-0.22	6.1-7.3	0-2	Low-----	0.32	2	6	1-3
	4-15	35-50	1.40-1.60	0.01-0.06	0.11-0.16	6.6-9.0	4-16	High-----	0.32			
	15-60	35-45	1.40-1.60	0.01-0.06	0.11-0.16	7.9-9.0	4-16	High-----	0.32			
Cn-----	0-7	27-34	1.20-1.50	0.2-0.6	0.20-0.22	6.6-8.4	0-4	Moderate	0.32	5	4L	4-7
Colvin-----	7-36	18-34	1.20-1.50	0.06-2.0	0.16-0.20	7.4-8.4	0-4	Moderate	0.32			
	36-60	18-34	1.30-1.50	0.06-2.0	0.15-0.20	7.4-8.4	0-4	Moderate	0.32			
Cr:												
Cresbard-----	0-9	20-26	1.15-1.30	0.6-2.0	0.17-0.20	5.6-7.3	0-2	Low-----	0.32	5	6	2-5
	9-12	27-40	1.20-1.35	0.2-0.6	0.14-0.17	5.6-7.3	2-4	Moderate	0.32			
	12-20	35-50	1.20-1.35	0.06-0.6	0.11-0.14	6.1-8.4	2-4	High-----	0.32			
	20-30	35-50	1.20-1.35	0.06-0.6	0.11-0.15	7.4-9.0	2-4	High-----	0.37			
	30-60	25-35	1.40-1.60	0.2-0.6	0.16-0.20	7.4-9.0	2-8	Moderate	0.37			
Cavour-----	0-7	18-25	1.10-1.25	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-----	0.32	2	6	4-6
	7-19	35-50	1.25-1.40	0.06-0.2	0.10-0.16	6.6-9.0	4-16	High-----	0.28			
	19-31	25-50	1.24-1.50	0.01-0.2	0.10-0.16	7.4-9.0	8-16	High-----	0.37			
	31-60	25-35	1.50-1.75	0.01-0.6	0.11-0.15	7.4-9.0	8-16	Moderate	0.37			
Cu-----	0-10	27-34	1.15-1.30	0.6-2.0	0.19-0.22	6.6-8.4	0-4	Moderate	0.28	5	4L	1-6
Cubden-----	10-22	18-34	1.30-1.50	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.32			
	22-60	18-34	1.30-1.50	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.43			
Cw:												
Cubden-----	0-10	27-34	1.15-1.30	0.6-2.0	0.19-0.22	6.6-8.4	0-4	Moderate	0.28	5	4L	1-6
	10-22	18-34	1.30-1.50	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.32			
	22-60	18-34	1.30-1.50	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.43			
Badger-----	0-10	27-35	1.15-1.25	0.2-0.6	0.19-0.22	6.1-7.3	0-2	Moderate	0.37	5	7	4-8
	10-30	35-50	1.25-1.40	0.06-0.2	0.11-0.17	6.1-7.3	0-2	High-----	0.28			
	30-60	20-45	1.40-1.50	0.06-0.6	0.14-0.20	6.6-8.4	0-4	Moderate	0.37			
Cx:												
Cubden-----	0-10	27-34	1.15-1.30	0.6-2.0	0.19-0.22	6.6-8.4	0-4	Moderate	0.28	5	4L	1-6
	10-22	18-34	1.30-1.50	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.32			
	22-60	18-34	1.30-1.50	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.43			
Tonka-----	0-17	18-27	1.00-1.50	0.6-2.0	0.18-0.23	5.6-7.8	0-0	Low-----	0.37	5	6	5-10
	17-42	35-45	1.40-1.65	0.06-0.2	0.14-0.19	5.6-7.8	0-2	High-----	0.43			
	42-60	18-39	1.40-1.70	0.2-0.6	0.14-0.19	6.6-8.4	0-4	Moderate	0.37			
Dd-----	0-9	15-27	1.10-1.40	0.6-2.0	0.18-0.22	7.4-8.4	0-0	Low-----	0.24	4	4L	2-8
Divide-----	9-25	18-30	1.20-1.50	0.6-2.0	0.16-0.19	7.4-8.4	0-0	Low-----	0.20			
	25-60	0-10	1.30-1.70	6.0-20	0.03-0.07	7.4-8.4	0-0	Low-----	0.10			
Do-----	0-8	40-60	1.20-1.30	0.06-0.6	0.14-0.18	6.1-7.8	0-0	High-----	0.28	5	4	5-10
Dovray-----	8-20	40-60	1.20-1.30	0.06-0.6	0.13-0.16	6.1-7.8	0-0	High-----	0.37			
	20-46	40-60	1.20-1.30	0.06-0.6	0.13-0.16	6.6-7.8	0-0	High-----	0.37			
	46-60	25-60	1.20-1.40	0.06-0.2	0.13-0.19	6.6-8.4	0-0	High-----	0.37			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodi- bility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
EaA----- Eckman	0-7	12-18	1.10-1.50	0.6-2.0	0.20-0.22	6.6-7.8	0-0	Low-----	0.28	5	3	2-6
	7-31	10-18	1.20-1.60	0.6-2.0	0.17-0.22	6.6-8.4	0-0	Low-----	0.43			
	31-60	10-18	1.20-1.70	0.6-2.0	0.14-0.22	7.4-8.4	0-0	Low-----	0.43			
EbB: Eckman-----	0-7	12-18	1.10-1.50	0.6-2.0	0.20-0.22	6.6-7.8	0-0	Low-----	0.28	5	3	2-6
	7-31	10-18	1.20-1.60	0.6-2.0	0.17-0.22	6.6-8.4	0-0	Low-----	0.43			
	31-60	10-18	1.20-1.70	0.6-2.0	0.14-0.22	7.4-8.4	0-0	Low-----	0.43			
Gardena-----	0-20	12-18	1.10-1.50	0.6-6.0	0.20-0.22	6.6-7.8	0-0	Low-----	0.28	5	3	4-8
	20-60	10-18	1.20-1.70	0.6-6.0	0.17-0.22	7.4-8.4	0-2	Low-----	0.43			
EcB: Eckman-----	0-7	12-18	1.10-1.50	0.6-2.0	0.20-0.22	6.6-7.8	0-0	Low-----	0.28	5	3	2-6
	7-31	10-18	1.20-1.60	0.6-2.0	0.17-0.22	6.6-8.4	0-0	Low-----	0.43			
	31-60	10-18	1.20-1.70	0.6-2.0	0.14-0.22	7.4-8.4	0-0	Low-----	0.43			
Zell-----	0-7	5-15	1.25-1.35	0.6-2.0	0.17-0.19	6.6-8.4	0-2	Low-----	0.32	5	3	2-5
	7-23	10-18	1.25-1.40	0.6-2.0	0.15-0.20	7.4-8.4	0-2	Low-----	0.43			
	23-60	5-18	1.25-1.40	0.6-2.0	0.15-0.20	7.4-8.4	0-2	Low-----	0.43			
EdC----- Edgeley	0-5	18-26	1.30-1.40	0.6-2.0	0.20-0.22	6.1-7.3	0-0	Low-----	0.32	3	6	3-7
	5-30	18-34	1.30-1.50	0.6-2.0	0.13-0.19	6.1-8.4	0-0	Moderate	0.37			
	30-60	---	---	0.01-0.2	---	---	---	---	---			
EgB: Egeland-----	0-8	10-18	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	0-2	Low-----	0.20	5	3	1-3
	8-30	10-18	1.30-1.45	2.0-6.0	0.09-0.15	6.1-7.8	0-2	Low-----	0.20			
	30-60	5-10	1.40-1.65	2.0-6.0	0.08-0.10	6.6-8.4	0-2	Low-----	0.17			
Embden-----	0-9	10-18	1.40-1.60	2.0-6.0	0.13-0.18	6.1-7.3	0-0	Low-----	0.20	5	3	4-7
	9-51	10-18	1.40-1.60	2.0-6.0	0.12-0.17	6.6-7.8	0-0	Low-----	0.20			
	51-60	5-18	1.40-1.60	2.0-6.0	0.06-0.16	7.4-8.4	0-0	Low-----	0.24			
En: Exline-----	0-2	20-26	1.25-1.30	0.6-2.0	0.19-0.22	6.1-7.8	0-2	Low-----	0.37	2	6	1-3
	2-26	35-55	1.25-1.40	0.01-0.06	0.10-0.15	6.6-9.0	4-16	High-----	0.28			
	26-37	35-50	1.25-1.40	0.06-0.2	0.14-0.17	7.9-9.0	4-8	High-----	0.43			
	37-60	25-35	1.25-1.40	0.06-0.2	0.14-0.17	7.9-9.0	2-8	Moderate	0.43			
Aberdeen-----	0-12	20-26	1.10-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Low-----	0.37	5	6	3-6
	12-37	35-55	1.20-1.35	0.06-0.2	0.13-0.18	6.6-8.4	0-4	High-----	0.37			
	37-45	30-55	1.20-1.35	0.06-0.2	0.14-0.17	7.4-9.0	2-8	High-----	0.37			
	45-60	10-26	1.25-1.40	0.06-0.2	0.14-0.17	7.4-9.0	2-8	Low-----	0.43			
Nahon-----	0-7	23-26	1.20-1.30	0.2-0.6	0.19-0.22	5.6-7.3	0-2	Low-----	0.37	2	6	2-6
	7-8	20-30	1.20-1.35	0.2-0.6	0.19-0.22	5.6-7.3	0-2	Moderate	0.37			
	8-25	35-55	1.25-1.45	0.01-0.06	0.10-0.15	6.6-9.0	0-2	High-----	0.37			
	25-40	23-55	1.20-1.35	0.06-0.2	0.11-0.19	7.4-9.0	4-16	High-----	0.37			
	40-60	30-60	1.05-1.35	0.01-0.6	0.14-0.17	7.9-9.0	4-16	Moderate	0.43			
Ep: Exline-----	0-2	20-26	1.25-1.30	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Low-----	0.37	2	6	1-3
	2-26	35-50	1.25-1.40	0.01-0.06	0.10-0.15	6.6-9.0	4-16	High-----	0.43			
	26-37	30-40	1.25-1.35	0.06-0.2	0.14-0.17	7.9-9.0	4-8	Moderate	0.43			
	37-60	25-35	1.25-1.40	0.06-0.2	0.14-0.17	7.9-9.0	2-8	Moderate	0.43			
Putney-----	0-8	20-26	1.10-1.25	0.6-2.0	0.19-0.22	6.1-7.8	0-2	Moderate	0.37	5	6	2-6
	8-15	18-30	1.15-1.30	0.6-2.0	0.19-0.22	6.6-8.4	0-4	Moderate	0.37			
	15-25	25-45	1.15-1.30	0.6-2.0	0.14-0.17	7.4-9.0	8-16	Moderate	0.43			
	25-60	18-25	1.20-1.35	0.06-2.0	0.14-0.17	7.4-9.0	4-16	Low-----	0.43			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodi- bility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Fd----- Fordville	0-9	18-25	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.3	0-2	Low-----	0.24	4	6	3-7
	9-20	18-30	1.25-1.40	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.28			
	20-29	15-30	1.25-1.45	0.6-6.0	0.12-0.18	6.1-8.4	0-2	Low-----	0.28			
	29-60	0-5	1.60-1.80	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-----	0.10			
FmA, FmB:												
Forman-----	0-8	18-27	1.20-1.40	0.6-2.0	0.20-0.24	6.6-7.8	0-2	Low-----	0.24	5	6	4-8
	8-15	30-35	1.30-1.50	0.6-2.0	0.15-0.19	6.6-7.8	0-2	Moderate	0.32			
	15-60	18-35	1.30-1.50	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
Aastad-----	0-14	24-27	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.8	0-0	Moderate	0.24	5	6	4-6
	14-29	28-35	1.45-1.60	0.2-0.6	0.15-0.19	6.6-7.8	0-0	Moderate	0.28			
	29-60	24-35	1.55-1.65	0.2-0.6	0.14-0.16	7.4-8.4	0-0	Moderate	0.37			
FnB:												
Forman-----	0-8	18-27	1.20-1.40	0.6-2.0	0.20-0.24	6.6-7.8	0-2	Low-----	0.24	5	6	4-8
	8-15	30-35	1.30-1.50	0.6-2.0	0.15-0.19	6.6-7.8	0-2	Moderate	0.32			
	15-60	18-35	1.30-1.50	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
Aastad-----	0-14	24-27	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.8	0-0	Moderate	0.24	5	6	4-6
	14-29	28-35	1.45-1.60	0.2-0.6	0.15-0.19	6.6-7.8	0-0	Moderate	0.28			
	29-60	24-35	1.55-1.65	0.2-0.6	0.14-0.16	7.4-8.4	0-0	Moderate	0.37			
Parnell-----	0-17	27-40	1.20-1.30	0.2-0.6	0.18-0.22	6.1-7.8	0-2	Moderate	0.37	5	7	6-10
	17-38	35-60	1.20-1.30	0.06-0.2	0.13-0.19	6.1-7.8	0-2	High-----	0.37			
	38-60	35-45	1.20-1.40	0.06-0.2	0.11-0.19	6.6-8.4	0-2	High-----	0.43			
FoB, FoC:												
Forman-----	0-8	18-27	1.20-1.40	0.6-2.0	0.20-0.24	6.6-7.8	0-2	Low-----	0.24	5	6	4-8
	8-15	30-35	1.30-1.50	0.6-2.0	0.15-0.19	6.6-7.8	0-2	Moderate	0.32			
	15-60	18-35	1.30-1.50	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
Buse-----	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	---	Low-----	0.28	5	4L	1-3
	7-22	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	---	Moderate	0.37			
	22-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	---	Moderate	0.37			
Aastad-----	0-14	24-27	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.8	0-0	Moderate	0.24	5	6	4-6
	14-29	28-35	1.45-1.60	0.2-0.6	0.15-0.19	6.6-7.8	0-0	Moderate	0.28			
	29-60	24-35	1.55-1.65	0.2-0.6	0.14-0.16	7.4-8.4	0-0	Moderate	0.37			
FpB, FpC:												
Forman-----	0-8	18-27	1.20-1.40	0.6-2.0	0.20-0.24	6.6-7.8	0-2	Low-----	0.24	5	6	4-8
	8-15	30-35	1.30-1.50	0.6-2.0	0.15-0.19	6.6-7.8	0-2	Moderate	0.32			
	15-60	18-35	1.30-1.50	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
Buse-----	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	---	Low-----	0.28	5	4L	1-3
	7-22	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	---	Moderate	0.37			
	22-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	---	Moderate	0.37			
Parnell-----	0-17	27-40	1.20-1.30	0.2-0.6	0.18-0.22	6.1-7.8	0-2	Moderate	0.37	5	7	6-10
	17-38	35-60	1.20-1.30	0.06-0.2	0.13-0.19	6.1-7.8	0-2	High-----	0.37			
	38-60	35-45	1.20-1.40	0.06-0.2	0.11-0.19	6.6-8.4	0-2	High-----	0.43			
Gb-----												
Great Bend	0-7	20-26	1.10-1.25	0.6-2.0	0.19-0.22	6.1-7.8	0-2	Low-----	0.32	5	6	2-4
	7-17	18-30	1.15-1.30	0.6-2.0	0.17-0.20	6.6-8.4	0-2	Moderate	0.32			
	17-39	18-30	1.15-1.30	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Low-----	0.43			
	39-52	18-25	1.20-1.35	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Low-----	0.43			
	52-60	18-25	1.20-1.35	0.06-2.0	0.17-0.20	7.4-8.4	0-8	Low-----	0.43			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodi- bility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Gp:												
Great Bend-----	0-7	20-26	1.10-1.25	0.6-2.0	0.19-0.22	6.1-7.8	0-2	Low-----	0.32	5	6	2-4
	7-17	18-30	1.15-1.30	0.6-2.0	0.17-0.20	6.6-8.4	0-2	Moderate	0.32			
	17-39	18-30	1.15-1.30	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Low-----	0.43			
	39-52	18-25	1.20-1.35	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Low-----	0.43			
	52-60	18-25	1.20-1.35	0.06-2.0	0.17-0.20	7.4-8.4	0-8	Low-----	0.43			
Putney-----	0-8	20-26	1.10-1.25	0.6-2.0	0.19-0.22	6.1-7.8	0-2	Moderate	0.37	5	6	2-6
	8-15	18-30	1.15-1.30	0.6-2.0	0.19-0.22	6.6-8.4	0-4	Moderate	0.37			
	15-25	25-45	1.15-1.30	0.6-2.0	0.14-0.17	7.4-9.0	8-16	Moderate	0.43			
	25-60	18-25	1.20-1.35	0.06-2.0	0.14-0.17	7.4-9.0	4-16	Low-----	0.43			
GzC:												
Great Bend-----	0-7	20-26	1.10-1.25	0.6-2.0	0.19-0.22	6.1-7.8	0-2	Low-----	0.32	5	6	2-4
	7-17	18-30	1.15-1.30	0.6-2.0	0.17-0.20	6.6-8.4	0-2	Moderate	0.32			
	17-39	18-30	1.15-1.30	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Low-----	0.43			
	39-52	18-25	1.20-1.35	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Low-----	0.43			
	52-60	18-25	1.20-1.35	0.06-2.0	0.17-0.20	7.4-8.4	0-8	Low-----	0.43			
Zell-----	0-7	10-18	1.15-1.30	0.6-2.0	0.19-0.22	6.6-8.4	0-2	Low-----	0.32	5	4L	2-5
	7-23	10-18	1.25-1.40	0.6-2.0	0.15-0.20	7.4-8.4	0-2	Low-----	0.43			
	23-60	5-18	1.25-1.40	0.6-2.0	0.15-0.20	7.4-8.4	0-2	Low-----	0.43			
Huffton-----	0-7	10-18	1.15-1.30	0.6-2.0	0.20-0.22	6.6-8.4	0-2	Low-----	0.37	5	4L	1-4
	7-25	15-30	1.20-1.35	0.6-2.0	0.12-0.17	7.4-9.0	4-16	Moderate	0.37			
	25-60	10-25	1.20-1.35	0.06-2.0	0.15-0.20	7.9-9.0	4-8	Low-----	0.43			
HaA, HaB-----	0-11	18-27	1.30-1.60	0.6-2.0	0.18-0.24	6.6-8.4	0-2	Moderate	0.24	5	4L	3-7
Hamery	11-28	18-35	1.20-1.60	0.6-2.0	0.15-0.19	7.4-8.4	0-4	Moderate	0.28			
	28-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
Hb:												
Hamery-----	0-11	18-27	1.30-1.60	0.6-2.0	0.18-0.24	6.6-8.4	0-2	Moderate	0.24	5	4L	3-7
	11-28	18-35	1.20-1.60	0.6-2.0	0.15-0.19	7.4-8.4	0-4	Moderate	0.28			
	28-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
Parnell-----	0-17	27-40	1.20-1.30	0.2-0.6	0.18-0.22	6.1-7.8	0-2	Moderate	0.37	5	7	6-10
	17-38	35-60	1.20-1.30	0.06-0.2	0.13-0.19	6.1-7.8	0-2	High-----	0.37			
	38-60	35-45	1.20-1.40	0.06-0.2	0.11-0.19	6.6-8.4	0-2	High-----	0.43			
Hd:												
Harmony-----	0-10	27-34	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.37	5	7	4-8
	10-26	35-50	1.25-1.45	0.2-0.6	0.13-0.18	6.6-8.4	0-2	High-----	0.37			
	26-60	10-30	1.30-1.40	0.06-2.0	0.11-0.20	6.6-8.4	2-4	Moderate	0.43			
Aberdeen-----	0-12	27-33	1.15-1.25	0.2-0.6	0.19-0.22	5.6-7.3	0-2	Moderate	0.37	5	7	3-6
	12-37	35-55	1.20-1.35	0.06-0.2	0.13-0.18	6.6-8.4	0-4	High-----	0.37			
	37-45	30-55	1.20-1.35	0.06-0.2	0.14-0.17	7.4-9.0	2-8	High-----	0.37			
	45-60	10-26	1.25-1.40	0.06-2.0	0.14-0.17	7.4-9.0	2-8	Low-----	0.43			
Hm:												
Harmony-----	0-10	20-26	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Low-----	0.37	5	6	4-8
	10-26	35-50	1.25-1.45	0.2-0.6	0.13-0.18	6.6-8.4	0-2	High-----	0.37			
	26-60	10-30	1.30-1.40	0.06-2.0	0.11-0.20	6.6-8.4	2-4	Moderate	0.43			
Beotia-----	0-10	20-27	1.10-1.25	0.6-2.0	0.19-0.22	6.1-7.8	0-2	Low-----	0.37	5	6	4-8
	10-24	18-30	1.15-1.30	0.6-2.0	0.19-0.22	6.1-7.8	0-2	Moderate	0.37			
	24-35	18-30	1.20-1.35	0.2-2.0	0.17-0.20	7.4-8.4	0-4	Moderate	0.37			
	35-60	18-35	1.20-1.35	0.06-2.0	0.17-0.20	7.4-8.4	0-8	Moderate	0.43			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodi- bility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Hr----- Harriet	0-1	12-25	1.10-1.40	0.6-2.0	0.18-0.22	6.6-8.4	0-2	Moderate	0.32	2	6	3-6
	1-16	35-50	1.20-1.60	0.01-0.06	0.10-0.15	7.4-9.0	4-16	High-----	0.37			
	16-60	18-40	1.20-1.60	0.6-2.0	0.10-0.15	7.9-9.0	4-16	Moderate	0.37			
HtA----- Hetland	0-9	35-45	1.20-1.30	0.06-0.2	0.13-0.19	5.6-7.3	0-2	High-----	0.37	5	4	4-7
	9-29	35-50	1.20-1.40	0.06-0.2	0.11-0.19	5.6-7.3	0-2	High-----	0.37			
	29-37	35-50	1.30-1.40	0.06-0.2	0.11-0.20	7.4-8.4	0-2	High-----	0.37			
	37-60	25-40	1.25-1.45	0.06-0.6	0.11-0.20	6.6-8.4	0-4	High-----	0.37			
HuB: Hetland-----	0-9	35-45	1.20-1.30	0.06-0.2	0.13-0.19	5.6-7.3	0-2	High-----	0.37	5	4	4-7
	9-29	35-50	1.20-1.40	0.06-0.2	0.11-0.19	5.6-7.3	0-2	High-----	0.37			
	29-37	35-50	1.30-1.40	0.06-0.2	0.11-0.20	7.4-8.4	0-2	High-----	0.37			
	37-60	25-40	1.25-1.45	0.06-0.6	0.11-0.20	6.6-8.4	0-4	High-----	0.37			
Rusklyn-----	0-9	27-35	1.15-1.25	0.6-2.0	0.19-0.22	6.6-7.8	0-2	Moderate	0.32	5	4L	1-4
	9-28	18-35	1.20-1.35	0.6-2.0	0.17-0.20	7.4-9.0	0-2	Moderate	0.32			
	28-53	18-35	1.20-1.35	0.6-2.0	0.17-0.20	7.4-9.0	0-2	Moderate	0.43			
	53-60	18-35	1.30-1.70	0.2-0.6	0.17-0.20	7.9-9.0	0-4	Moderate	0.37			
KbE: Kloten-----	0-6	18-26	1.30-1.40	0.6-2.0	0.17-0.22	6.1-8.4	0-0	Moderate	0.32	2	6	3-6
	6-14	18-34	1.30-1.40	0.6-2.0	0.05-0.19	6.1-8.4	0-0	Moderate	0.32			
	14-60	---	---	0.01-0.2	---	---	---	-----	---			
Buse-----	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	---	Low-----	0.28	5	4L	1-3
	7-22	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	---	Moderate	0.37			
	22-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	---	Moderate	0.37			
Krb: Kranzburg-----	0-9	24-26	1.10-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Low-----	0.28	5	6	4-8
	9-27	24-34	1.20-1.35	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	27-39	25-30	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-4	Moderate	0.37			
	39-60	25-30	1.50-1.70	0.2-0.6	0.16-0.20	7.4-9.0	0-8	Moderate	0.37			
Brookings-----	0-13	20-27	1.10-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-0	Low-----	0.28	5	6	4-8
	13-27	27-35	1.20-1.35	0.6-2.0	0.19-0.22	6.6-8.4	0-0	Moderate	0.32			
	27-60	20-35	1.50-1.70	0.2-2.0	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			
Buse-----	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	---	Low-----	0.28	5	4L	1-3
	7-22	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	---	Moderate	0.37			
	22-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	---	Moderate	0.37			
Ks: Kranzburg-----	0-9	24-26	1.10-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Low-----	0.28	5	6	4-8
	9-27	24-34	1.20-1.35	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	27-39	25-30	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-4	Moderate	0.37			
	39-60	25-30	1.50-1.70	0.2-0.6	0.16-0.20	7.4-9.0	0-8	Moderate	0.37			
Brookings-----	0-13	20-27	1.10-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-0	Low-----	0.28	5	6	4-8
	13-27	27-35	1.20-1.35	0.6-2.0	0.19-0.22	6.6-8.4	0-0	Moderate	0.32			
	27-60	20-35	1.50-1.70	0.2-2.0	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			
KtB: Kranzburg-----	0-9	27-34	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	4-8
	9-23	24-34	1.20-1.35	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	23-36	24-34	1.20-1.35	0.6-2.0	0.18-0.22	6.6-8.4	0-2	Moderate	0.32			
	36-43	25-30	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-4	Moderate	0.37			
	43-60	25-30	1.50-1.70	0.2-0.6	0.16-0.20	7.4-9.0	0-8	Moderate	0.37			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
KtB:												
Forman-----	0-8	18-27	1.20-1.40	0.6-2.0	0.20-0.24	6.6-7.8	0-2	Low-----	0.24	5	6	4-8
	8-15	30-35	1.30-1.50	0.6-2.0	0.15-0.19	6.6-7.8	0-2	Moderate	0.32			
	15-60	18-35	1.30-1.50	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
La-----	0-16	18-27	1.10-1.40	0.6-2.0	0.17-0.22	6.6-8.4	0-2	Low-----	0.24	5	6	2-6
La Prairie	16-31	18-35	1.10-1.50	0.6-2.0	0.17-0.22	6.6-8.4	0-2	Moderate	0.28			
	31-60	18-35	1.30-1.70	0.6-2.0	0.15-0.22	6.6-8.4	0-2	Moderate	0.28			
Lh:												
La Prairie-----	0-16	18-27	1.10-1.40	0.6-2.0	0.17-0.22	6.6-8.4	0-0	Low-----	0.24	5	6	2-6
	16-31	18-35	1.10-1.50	0.6-2.0	0.17-0.22	6.6-8.4	0-0	Moderate	0.32			
	31-60	18-35	1.30-1.70	0.6-2.0	0.15-0.22	6.6-8.4	0-0	Moderate	0.32			
Holmquist-----	0-8	18-27	1.20-1.30	0.6-2.0	0.18-0.20	7.4-8.4	2-4	Low-----	0.24	5	4L	3-6
	8-60	12-35	1.30-1.60	0.6-2.0	0.12-0.20	7.4-9.0	4-8	Moderate	0.28			
Lm-----	0-28	27-34	1.15-1.25	0.2-2.0	0.19-0.22	7.4-8.4	0-4	Moderate	0.28	5	4L	4-8
Lamoure	28-56	25-34	1.20-1.35	0.2-2.0	0.17-0.20	7.4-8.4	0-4	Moderate	0.32			
	56-60	20-34	1.25-1.40	0.2-2.0	0.09-0.18	7.4-8.4	0-4	Low-----	0.28			
Lo-----	0-8	24-27	1.20-1.30	0.6-2.0	0.17-0.20	6.6-8.4	0-2	Low-----	0.24	5	4L	5-8
Lowe	8-34	24-35	1.25-1.35	0.6-2.0	0.15-0.19	7.4-8.4	0-2	Moderate	0.28			
	34-60	10-30	1.35-1.50	0.6-2.0	0.13-0.19	7.4-8.4	0-4	Moderate	0.28			
Lu, Lw-----	0-7	40-60	1.10-1.30	0.06-0.2	0.16-0.18	6.1-8.4	0-4	High-----	0.28	5	4	4-9
Ludden	7-31	40-60	1.20-1.50	0.06-0.2	0.13-0.16	7.9-8.4	0-4	High-----	0.28			
	31-60	35-60	1.20-1.50	0.06-0.2	0.13-0.16	7.9-8.4	0-8	High-----	0.32			
Lx:												
Ludden-----	0-7	40-60	1.10-1.30	0.06-0.2	0.16-0.18	6.1-8.4	0-4	High-----	0.28	5	4	4-9
	7-31	40-60	1.20-1.50	0.06-0.2	0.13-0.16	7.9-8.4	0-4	High-----	0.28			
	31-60	35-60	1.20-1.50	0.06-0.2	0.13-0.16	7.9-8.4	0-8	High-----	0.32			
Ludden, saline--	0-7	40-60	1.10-1.30	0.06-0.2	0.12-0.14	6.1-8.4	4-8	High-----	0.28	5	4	4-9
	7-31	40-60	1.20-1.50	0.06-0.2	0.06-0.08	7.9-8.4	8-16	High-----	0.28			
	31-60	35-60	1.20-1.50	0.06-0.2	0.06-0.08	7.9-8.4	8-16	High-----	0.32			
MaA, MaB, MaC:												
Maddock-----	0-9	5-15	1.35-1.45	6.0-20	0.13-0.18	6.6-7.8	0-0	Low-----	0.20	5	3	1-3
	9-60	3-9	1.35-1.45	6.0-20	0.05-0.13	6.6-8.4	0-0	Low-----	0.17			
Egeland-----	0-8	10-18	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	0-2	Low-----	0.20	5	3	1-3
	8-30	10-18	1.30-1.45	2.0-6.0	0.09-0.15	6.1-7.8	0-2	Low-----	0.20			
	30-60	5-10	1.40-1.65	2.0-6.0	0.08-0.10	6.6-8.4	0-2	Low-----	0.17			
Md:												
Marysland-----	0-14	18-30	1.20-1.30	0.6-2.0	0.17-0.22	7.9-8.4	0-2	Moderate	0.24	4	4L	1-6
	14-30	18-30	1.35-1.50	0.6-2.0	0.15-0.19	7.9-8.4	0-2	Moderate	0.32			
	30-60	1-5	1.55-1.65	6.0-20	0.02-0.07	7.9-8.4	0-2	Low-----	0.10			
Divide-----	0-9	15-27	1.10-1.40	0.6-2.0	0.18-0.22	7.4-8.4	0-0	Low-----	0.24	4	4L	2-8
	9-25	18-30	1.20-1.50	0.6-2.0	0.16-0.19	7.4-8.4	0-0	Low-----	0.20			
	25-60	0-10	1.30-1.70	6.0-20	0.03-0.07	7.4-8.4	0-0	Low-----	0.10			
MfB-----	0-4	27-35	1.20-1.60	0.2-0.6	0.14-0.20	6.6-8.4	0-8	Moderate	0.24	5	4L	3-7
Mauvais	4-60	18-35	1.30-1.60	0.2-0.6	0.12-0.16	7.4-8.4	2-8	Moderate	0.24			
MgB-----	0-4	27-35	1.20-1.30	0.2-0.6	0.19-0.22	6.6-8.4	0-8	High-----	0.15	5	8	2-7
Mauvais	4-60	18-35	1.50-1.70	0.2-0.6	0.08-0.16	7.4-8.4	2-8	High-----	0.28			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodi- bility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
MnA----- Minnewasta	0-4	10-18	1.40-1.60	2.0-6.0	0.11-0.17	6.6-8.4	0-2	Low-----	0.24	5	3	2-6
	4-16	3-15	1.40-1.60	6.0-20	0.03-0.10	7.4-9.0	0-4	Low-----	0.10			
	16-60	18-40	1.30-1.60	0.06-0.2	0.08-0.16	7.9-9.0	2-8	Moderate	0.37			
MoB----- Minnewasta	0-4	10-18	1.40-1.60	2.0-6.0	0.11-0.17	6.6-8.4	0-2	Low-----	0.17	5	8	1-3
	4-16	3-15	1.40-1.60	6.0-20	0.03-0.10	7.4-9.0	0-4	Low-----	0.10			
	16-60	18-40	1.30-1.60	0.06-0.2	0.08-0.16	7.9-9.0	2-8	Moderate	0.28			
Mw----- Minnewaukan	0-4	1-10	1.35-1.50	6.0-20	0.05-0.10	7.4-8.4	2-4	Low-----	0.17	5	2	2-6
	4-60	1-5	1.40-1.70	6.0-20	0.05-0.10	7.4-8.4	2-4	Low-----	0.15			
Na:												
Nahon-----	0-7	23-26	1.20-1.30	0.2-0.6	0.19-0.22	5.6-7.3	0-2	Low-----	0.37	2	6	2-6
	7-8	20-30	1.20-1.35	0.2-0.6	0.19-0.22	5.6-7.3	0-2	Moderate	0.37			
	8-25	35-55	1.25-1.45	0.01-0.06	0.10-0.15	6.6-9.0	0-2	High-----	0.37			
	25-40	23-55	1.20-1.35	0.06-0.2	0.11-0.19	7.4-9.0	4-16	High-----	0.37			
	40-60	30-60	1.05-1.35	0.01-0.6	0.14-0.17	7.9-9.0	4-16	Moderate	0.43			
Aberdeen-----	0-12	20-26	1.10-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Low-----	0.37	5	6	3-6
	12-37	35-55	1.20-1.35	0.06-0.2	0.13-0.18	6.6-8.4	0-4	High-----	0.37			
	37-45	30-55	1.20-1.35	0.06-0.2	0.14-0.17	7.4-9.0	2-8	High-----	0.37			
	45-60	10-26	1.25-1.40	0.06-2.0	0.14-0.17	7.4-9.0	2-8	Low-----	0.43			
Exline-----	0-2	20-26	1.25-1.30	0.6-2.0	0.19-0.22	6.1-7.8	0-2	Low-----	0.37	2	6	1-3
	2-26	35-55	1.25-1.40	0.01-0.06	0.10-0.15	6.6-9.0	4-16	High-----	0.28			
	26-37	35-50	1.25-1.40	0.06-0.2	0.14-0.17	7.9-9.0	4-8	High-----	0.43			
	37-60	25-35	1.25-1.40	0.06-0.2	0.14-0.17	7.9-9.0	2-8	Moderate	0.43			
NsB:												
Nutley-----	0-7	40-60	1.15-1.30	0.06-0.2	0.10-0.16	6.6-8.4	0-2	Very high	0.28	5	4	4-7
	7-60	35-60	1.35-1.50	0.01-0.2	0.08-0.15	7.4-8.4	0-2	Very high	0.28			
Sinai-----	0-12	40-60	1.15-1.30	0.06-0.2	0.13-0.16	6.1-7.3	0-2	High-----	0.28	5	4	3-7
	12-23	45-60	1.20-1.40	0.06-0.2	0.17-0.19	6.6-7.8	0-2	Very high	0.37			
	23-42	45-60	1.20-1.40	0.01-0.2	0.11-0.17	7.4-8.4	0-2	Very high	0.37			
	42-60	30-50	1.35-1.40	0.01-0.2	0.11-0.17	7.4-8.4	0-2	High-----	0.43			
Oh----- Oldham	0-8	35-40	1.15-1.30	0.2-0.6	0.13-0.19	6.6-7.8	0-4	High-----	0.37	5	4	4-7
	8-47	35-45	1.25-1.40	0.06-0.6	0.14-0.20	7.4-8.4	0-4	High-----	0.37			
	47-60	20-40	1.30-1.50	0.06-0.6	0.14-0.20	7.4-8.4	0-2	Moderate	0.43			
Or----- Orthents	0-10	10-20	1.25-1.40	2.0-6.0	0.11-0.20	6.1-7.8	0-2	Low-----	0.20	3	5	.5-3
	10-60	0-5	1.60-1.80	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-----	0.10			
Pa----- Parnell	0-17	27-40	1.20-1.30	0.2-0.6	0.18-0.22	6.1-7.8	0-2	Moderate	0.37	5	7	6-10
	17-38	35-60	1.20-1.30	0.06-0.2	0.13-0.19	6.1-7.8	0-2	High-----	0.37			
	38-60	35-45	1.20-1.40	0.06-0.2	0.11-0.19	6.6-8.4	0-2	High-----	0.43			
Pc----- Playmoor	0-8	27-34	1.15-1.30	0.2-2.0	0.16-0.19	7.4-9.0	4-16	Moderate	0.28	5	4L	4-8
	8-25	20-34	1.20-1.35	0.2-2.0	0.16-0.19	7.4-9.0	4-16	Moderate	0.28			
	25-36	20-34	1.20-1.35	0.2-2.0	0.14-0.17	7.4-9.0	4-16	Moderate	0.32			
	36-60	20-34	1.20-1.40	0.2-2.0	0.14-0.17	7.4-9.0	4-16	Moderate	0.28			
Pm:												
Playmoor-----	0-8	27-34	1.15-1.30	0.2-2.0	0.16-0.19	7.4-9.0	4-16	Moderate	0.28	5	4L	4-8
	8-25	20-34	1.20-1.35	0.2-2.0	0.16-0.19	7.4-9.0	4-16	Moderate	0.28			
	25-36	20-34	1.20-1.35	0.2-2.0	0.14-0.17	7.4-9.0	4-16	Moderate	0.32			
	36-60	20-34	1.20-1.40	0.2-2.0	0.14-0.17	7.4-9.0	4-16	Moderate	0.28			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodi- bility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Pm:												
Lamoure-----	0-28	27-34	1.15-1.25	0.2-2.0	0.19-0.22	7.4-8.4	0-4	Moderate	0.28	5	4L	4-8
	28-56	20-34	1.20-1.35	0.2-2.0	0.17-0.20	7.4-8.4	0-4	Moderate	0.32			
	56-60	20-34	1.25-1.40	0.2-2.0	0.09-0.18	7.4-8.4	0-4	Moderate	0.28			
PrC:												
Poinsett-----	0-7	27-30	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-6
	7-16	20-32	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.32			
	16-39	20-32	1.20-1.35	0.6-2.0	0.18-0.21	7.4-8.4	0-2	Moderate	0.43			
	39-60	25-30	1.50-1.70	0.2-0.6	0.16-0.19	7.4-8.4	0-8	Moderate	0.37			
Rusklyn -----	0-9	27-35	1.15-1.25	0.6-2.0	0.19-0.22	6.6-7.8	0-2	Moderate	0.32	5	4L	1-4
	9-28	18-35	1.20-1.35	0.6-2.0	0.17-0.20	7.4-9.0	0-2	Moderate	0.32			
	28-53	18-35	1.20-1.35	0.6-2.0	0.17-0.20	7.4-9.0	0-2	Moderate	0.43			
	53-60	18-35	1.30-1.70	0.2-0.6	0.17-0.20	7.9-9.0	0-4	Moderate	0.37			
PsB:												
Poinsett-----	0-7	27-30	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-6
	7-16	20-32	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.32			
	16-39	20-32	1.20-1.35	0.6-2.0	0.18-0.21	7.4-8.4	0-2	Moderate	0.43			
	39-60	25-30	1.50-1.70	0.2-0.6	0.16-0.19	7.4-8.4	0-8	Moderate	0.37			
Rusklyn -----	0-9	27-35	1.15-1.25	0.6-2.0	0.19-0.22	6.6-7.8	0-2	Moderate	0.32	5	4L	1-4
	9-28	18-35	1.20-1.35	0.6-2.0	0.17-0.20	7.4-9.0	0-2	Moderate	0.32			
	28-53	18-35	1.20-1.35	0.6-2.0	0.17-0.20	7.4-9.0	0-2	Moderate	0.43			
	53-60	18-35	1.30-1.70	0.2-0.6	0.17-0.20	7.9-9.0	0-4	Moderate	0.37			
Waubay -----	0-12	27-35	1.35-1.45	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-8
	12-23	20-35	1.35-1.45	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	23-36	20-35	1.35-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	36-60	20-35	1.40-1.50	0.6-2.0	0.16-0.18	7.4-8.4	0-4	Moderate	0.43			
PwA, PwB:												
Poinsett-----	0-7	27-30	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-6
	7-16	20-32	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.32			
	16-39	20-32	1.20-1.35	0.6-2.0	0.18-0.21	7.4-8.4	0-2	Moderate	0.43			
	39-60	25-30	1.50-1.70	0.2-0.6	0.16-0.19	7.4-8.4	0-8	Moderate	0.37			
Waubay -----	0-12	27-35	1.35-1.45	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-8
	12-23	20-35	1.35-1.45	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	23-36	20-35	1.35-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	36-60	20-35	1.40-1.50	0.6-2.0	0.16-0.18	7.4-8.4	0-4	Moderate	0.43			
Ra:												
Ranslo-----	0-8	15-26	1.10-1.20	0.6-2.0	0.17-0.20	5.6-7.3	0-2	Low-----	0.32	2	6	4-7
	8-37	35-45	1.30-1.40	0.06-0.2	0.13-0.16	6.6-8.4	2-4	High-----	0.28			
	37-60	35-50	1.25-1.35	0.06-0.2	0.08-0.13	7.4-9.0	2-8	High-----	0.37			
Harriet -----	0-1	12-25	1.10-1.40	0.6-2.0	0.18-0.22	6.6-8.4	0-2	Moderate	0.32	2	6	3-6
	1-16	35-50	1.20-1.60	0.01-0.06	0.10-0.15	7.4-9.0	4-16	High-----	0.37			
	16-60	18-40	1.20-1.60	0.6-2.0	0.10-0.15	7.9-9.0	4-16	Moderate	0.37			
Rb -----	0-32	27-35	1.10-1.25	0.2-2.0	0.19-0.22	7.4-8.4	0-2	Moderate	0.28	5	4L	4-7
Rauville	32-52	20-45	1.10-1.30	0.2-2.0	0.17-0.20	7.4-8.4	0-4	Moderate	0.32			
	52-60	5-15	1.20-1.35	2.0-6.0	0.08-0.15	6.6-8.4	0-4	Low-----	0.10			
RfA, RfB:												
Renshaw-----	0-7	20-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-----	0.28	3	6	2-4
	7-18	18-27	1.30-1.45	0.6-6.0	0.11-0.18	6.6-8.4	0-2	Low-----	0.28			
	18-60	0-5	1.45-1.65	6.0-60	0.03-0.06	6.6-8.4	0-2	Low-----	0.10			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
RfA, RfB: Fordville-----	0-9	18-25	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.3	0-2	Low-----	0.24	4	6	3-7
	9-20	18-30	1.25-1.40	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.28			
	20-29	15-30	1.25-1.45	0.6-6.0	0.12-0.18	6.1-8.4	0-2	Low-----	0.28			
	29-60	0-5	1.60-1.80	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-----	0.10			
RsA: Renshaw-----	0-7	20-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-----	0.28	3	6	2-4
	7-18	18-27	1.30-1.45	0.6-6.0	0.11-0.18	6.6-8.4	0-2	Low-----	0.28			
	18-60	0-5	1.45-1.65	6.0-60	0.03-0.06	6.6-8.4	0-2	Low-----	0.10			
Sioux-----	0-7	14-25	1.20-1.30	0.6-2.0	0.17-0.20	6.6-8.4	0-2	Low-----	0.28	2	5	1-3
	7-11	10-20	1.20-1.50	2.0-6.0	0.10-0.15	7.4-8.4	0-2	Low-----	0.15			
	11-60	0-10	1.60-1.70	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-----	0.10			
RsB: Renshaw-----	0-7	20-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-----	0.28	3	6	2-4
	7-18	18-27	1.30-1.45	0.6-6.0	0.11-0.18	6.6-8.4	0-2	Low-----	0.28			
	18-60	0-5	1.45-1.65	6.0-60	0.03-0.06	6.6-8.4	0-2	Low-----	0.10			
Sioux-----	0-6	10-20	1.30-1.50	2.0-6.0	0.10-0.15	6.6-8.4	0-2	Low-----	0.15	2	5	1-3
	6-9	10-20	1.20-1.50	2.0-6.0	0.10-0.15	7.4-8.4	0-2	Low-----	0.15			
	9-60	0-10	1.60-1.70	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-----	0.10			
Ru: Ryan-----	0-5	30-40	1.00-1.20	0.06-0.2	0.18-0.23	7.4-8.4	0-0	High-----	0.37	2	7	3-7
	5-60	40-65	1.15-1.50	0.01-0.06	0.10-0.14	7.4-9.0	4-16	High-----	0.37			
Ludden-----	0-7	40-60	1.10-1.30	0.06-0.2	0.16-0.18	6.1-8.4	0-4	High-----	0.28	5	4	4-9
	7-31	40-60	1.20-1.50	0.06-0.2	0.13-0.16	7.9-8.4	0-4	High-----	0.28			
	31-60	35-60	1.20-1.50	0.06-0.2	0.13-0.16	7.9-8.4	0-8	High-----	0.32			
SaA: Sinai-----	0-12	40-60	1.15-1.30	0.06-0.2	0.13-0.16	6.1-7.3	0-2	High-----	0.28	5	4	3-7
	12-23	45-60	1.20-1.40	0.06-0.2	0.17-0.19	6.6-7.8	0-2	Very high	0.37			
	23-42	45-60	1.20-1.40	0.01-0.2	0.11-0.17	7.4-8.4	0-2	Very high	0.37			
	42-60	30-50	1.35-1.40	0.01-0.2	0.11-0.17	7.4-8.4	0-2	High-----	0.43			
Nutley-----	0-7	40-60	1.15-1.30	0.06-0.2	0.10-0.16	6.6-8.4	0-2	Very high	0.28	5	4	4-7
	7-60	35-60	1.35-1.50	0.01-0.2	0.08-0.15	7.4-8.4	0-2	Very high	0.28			
SbB: Sioux-----	0-6	10-20	1.30-1.50	2.0-6.0	0.10-0.15	6.6-8.4	0-2	Low-----	0.15	2	5	1-3
	6-9	10-20	1.20-1.50	2.0-6.0	0.10-0.15	7.4-8.4	0-2	Low-----	0.15			
	9-60	0-10	1.60-1.70	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-----	0.10			
ScB: Sioux-----	0-6	2-18	1.45-1.60	2.0-20	0.07-0.12	6.6-8.4	0-2	Low-----	0.15	2	8	1-3
	6-9	10-18	1.35-1.45	2.0-6.0	0.08-0.12	6.6-8.4	0-2	Low-----	0.15			
	9-60	0-10	1.50-1.70	6.0-20	0.03-0.06	7.4-8.4	0-2	Low-----	0.10			
SrD, SrE: Sioux-----	0-6	10-20	1.30-1.50	2.0-6.0	0.10-0.15	6.6-8.4	0-2	Low-----	0.15	2	5	1-3
	6-9	10-20	1.20-1.50	2.0-6.0	0.10-0.15	7.4-8.4	0-2	Low-----	0.15			
	9-60	0-10	1.60-1.70	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-----	0.10			
Renshaw-----	0-7	20-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-----	0.28	3	6	2-4
	7-18	18-27	1.30-1.45	0.6-6.0	0.11-0.18	6.6-8.4	0-2	Low-----	0.28			
	18-60	0-5	1.45-1.65	6.0-60	0.03-0.06	6.6-8.4	0-2	Low-----	0.10			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodi- bility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
SsE:												
Sioux-----	0-6	18-25	1.20-1.30	0.6-2.0	0.15-0.17	6.6-8.4	0-2	Low-----	0.20	2	8	1-3
	6-9	10-18	1.35-1.45	2.0-6.0	0.08-0.12	6.6-8.4	0-2	Low-----	0.15			
	9-60	0-10	1.50-1.70	6.0-20	0.03-0.06	7.4-8.4	0-2	Low-----	0.10			
Renshaw-----	0-7	18-25	1.35-1.50	2.0-6.0	0.09-0.13	6.1-7.8	0-2	Low-----	0.20	3	8	2-4
	7-18	18-27	1.30-1.45	0.6-6.0	0.11-0.15	6.6-7.8	0-2	Low-----	0.20			
	18-60	0-5	1.45-1.60	6.0-20	0.03-0.06	6.6-7.8	0-2	Low-----	0.10			
Sw-----	0-7	27-40	1.10-1.40	0.2-0.6	0.18-0.23	6.6-8.4	2-8	Moderate	0.37	5	4L	5-20
Southam	7-51	35-50	1.20-1.50	0.06-0.2	0.14-0.20	6.6-8.4	2-8	High-----	0.28			
	51-60	18-50	1.20-1.50	0.06-0.6	0.13-0.17	7.4-8.4	2-8	High-----	0.28			
To-----	0-17	18-27	1.00-1.50	0.6-2.0	0.18-0.23	5.6-7.8	0-0	Low-----	0.37	5	6	5-10
Tonka	17-42	35-45	1.40-1.65	0.06-0.2	0.14-0.19	5.6-7.8	0-2	High-----	0.43			
	42-60	18-39	1.40-1.70	0.2-0.6	0.14-0.19	6.6-8.4	0-4	Moderate	0.37			
Va-----	0-11	18-27	1.20-1.35	0.6-2.0	0.14-0.16	7.4-8.4	4-16	Low-----	0.24	5	4L	5-8
Vallars	11-26	18-35	1.40-1.55	0.2-0.6	0.10-0.13	7.4-8.4	4-16	Low-----	0.28			
	26-60	18-35	1.50-1.70	0.2-0.6	0.11-0.13	7.4-8.4	4-16	Low-----	0.37			
Vh:												
Vallars-----	0-11	18-27	1.20-1.35	0.6-2.0	0.22-0.24	7.4-8.4	0-4	Low-----	0.28	5	4L	5-8
	11-18	18-35	1.40-1.55	0.2-0.6	0.15-0.19	7.4-8.4	0-4	Moderate	0.28			
	18-60	18-35	1.50-1.70	0.2-0.6	0.17-0.19	7.4-8.4	0-4	Low-----	0.37			
Hamerly-----	0-11	18-27	1.30-1.60	0.6-2.0	0.18-0.24	6.6-8.4	0-2	Moderate	0.24	5	4L	3-7
	11-28	18-35	1.20-1.60	0.6-2.0	0.15-0.19	7.4-8.4	0-4	Moderate	0.28			
	28-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
VoA, VoB:												
Vienna-----	0-8	22-26	1.10-1.25	0.6-2.0	0.20-0.22	6.1-7.3	0-0	Low-----	0.28	5	6	3-8
	8-17	24-32	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	17-35	25-32	1.35-1.55	0.2-0.6	0.16-0.20	6.6-8.4	0-2	Moderate	0.37			
	35-60	20-32	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	2-4	Moderate	0.37			
Brookings-----	0-13	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-0	Moderate	0.28	5	7	4-8
	13-27	27-35	1.20-1.35	0.6-2.0	0.19-0.22	6.6-8.4	0-0	Moderate	0.32			
	27-60	20-35	1.50-1.70	0.2-2.0	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			

TABLE 17.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					<u>Ft</u>			<u>In</u>				
Aa----- Aastad	B	None-----	---	---	2.5-4.0	Apparent	Oct-Jun	>60	---	High-----	High-----	Moderate.
An: Aberdeen-----	C	None-----	---	---	3.5-5.0	Apparent	Apr-Jun	>60	---	Moderate	High-----	Moderate.
Nahon-----	D	None-----	---	---	3.5-5.0	Apparent	Apr-Jun	>60	---	Moderate	High-----	Moderate.
Aq----- Aquents	D	None-----	---	---	+2-1.0	Apparent	Jan-Dec	>60	---	High-----	High-----	High.
ArB----- Arvilla	B	None-----	---	---	>6.0	---	---	>60	---	Low-----	Moderate	Low.
Ba----- Bearden	C	None-----	---	---	1.5-3.5	Apparent	Apr-Jun	>60	---	High-----	High-----	Low.
BaB: Bearden-----	C	None-----	---	---	1.5-3.5	Apparent	Apr-Jun	>60	---	High-----	High-----	Low.
Huffton-----	B	None-----	---	---	>6.0	---	---	>60	---	High-----	High-----	Moderate.
BbA----- Beotia	B	None-----	---	---	>6.0	---	---	>60	---	High-----	High-----	Moderate.
Bc: Beotia-----	B	None-----	---	---	>6.0	---	---	>60	---	High-----	High-----	Moderate.
Rondell-----	B	None-----	---	---	3.5-5.0	Apparent	Oct-Jul	>60	---	High-----	High-----	Moderate.
BnD: Buse-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Low-----	Low.
Barnes-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
BoE: Buse-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Barnes-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
BpE: Buse-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Barnes-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					<u>Ft</u>			<u>In</u>				
BpE: Parnell-----	C/D	None-----	---	---	+1-0.5	Apparent	Jan-Dec	>60	---	High-----	High-----	Low.
BrE: Buse-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Low-----	Low.
Langhei-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
BsE: Buse-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Low-----	Low.
La Prairie-----	B	Occasional	Brief-----	Mar-Jun	3.5-5.0	Apparent	Mar-Jun	>60	---	Moderate	Moderate	Low.
Barnes-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
BxE: Buse-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Low-----	Low.
Sioux-----	A	None-----	---	---	>6.0	---	---	>60	---	Low-----	Low-----	Low.
Ca: Cavour-----	D	None-----	---	---	3.5-5.0	Apparent	Apr-Jun	>60	---	Moderate	High-----	Moderate.
Ferney-----	D	None-----	---	---	3.5-5.0	Apparent	Mar-Jun	>60	---	Moderate	High-----	Moderate.
Cn----- Colvin	C/D	None-----	---	---	0-1.0	Apparent	Apr-Jul	>60	---	High-----	High-----	Low.
Cr: Cresbard-----	C	None-----	---	---	3.5-5.0	Apparent	Apr-Jun	>60	---	Moderate	High-----	Moderate.
Cavour-----	D	None-----	---	---	3.5-5.0	Apparent	Apr-Jun	>60	---	Moderate	High-----	Moderate.
Cu----- Cubden	C	None-----	---	---	1.5-3.5	Apparent	Apr-Jun	>60	---	High-----	High-----	Low.
Cw: Cubden-----	C	None-----	---	---	1.5-3.5	Apparent	Apr-Jun	>60	---	High-----	High-----	Low.
Badger-----	C	Frequent-----	Brief-----	Mar-Oct	0-3.0	Perched	Oct-Jun	>60	---	High-----	High-----	Low.
Cx: Cubden-----	C	None-----	---	---	1.5-3.5	Apparent	Apr-Jun	>60	---	High-----	High-----	Low.
Tonka-----	C/D	None-----	---	---	+5-1.0	Apparent	Apr-Jun	>60	---	High-----	High-----	Low.
Dd----- Divide	B	None-----	---	---	1.5-3.5	Apparent	Apr-Jun	>60	---	Moderate	High-----	Low.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					<u>Ft</u>			<u>In</u>				
Do----- Dovray	C/D	None-----	---	---	+1-0.5	Apparent	Jan-Dec	>60	---	Moderate	High-----	Low.
EaA----- Eckman	B	None-----	---	---	>6.0	---	---	>60	---	High-----	Moderate	Low.
EbB: Eckman	B	None-----	---	---	>6.0	---	---	>60	---	High-----	Moderate	Low.
Gardena-----	B	None-----	---	---	3.0-5.0	Apparent	Apr-Jun	>60	---	High-----	Moderate	Low.
EcB: Eckman	B	None-----	---	---	>6.0	---	---	>60	---	High-----	Moderate	Low.
Zell-----	B	None-----	---	---	>6.0	---	---	>60	---	High-----	High-----	Moderate.
EdC----- Edgeley	C	None-----	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	Low.
EgB: Egeland	B	None-----	---	---	>6.0	---	---	>60	---	Low-----	Moderate	Low.
Emlden-----	B	None-----	---	---	3.5-5.0	Apparent	Apr-Jun	>60	---	Moderate	High-----	Low.
En: Exline	D	None-----	---	---	1.5-3.5	Apparent	Apr-Jun	>60	---	Moderate	High-----	High.
Aberdeen-----	C	None-----	---	---	3.5-5.0	Apparent	Apr-Jun	>60	---	Moderate	High-----	Moderate.
Nahon-----	D	None-----	---	---	3.5-5.0	Apparent	Apr-Jun	>60	---	Moderate	High-----	Moderate.
Ep: Exline	D	None-----	---	---	3.5-5.0	Apparent	Apr-Jun	>60	---	Moderate	High-----	High.
Putney-----	B	None-----	---	---	>6.0	---	---	>60	---	High-----	High-----	High.
Fd----- Fordville	B	None-----	---	---	>6.0	---	---	>60	---	Low-----	Moderate	Low.
FmA, FmB: Forman	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Aastad-----	B	None-----	---	---	2.5-4.0	Apparent	Oct-Jun	>60	---	High-----	High-----	Moderate.
FnB: Forman	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Aastad-----	B	None-----	---	---	2.5-4.0	Apparent	Oct-Jun	>60	---	High-----	High-----	Moderate.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					<u>Ft</u>			<u>In</u>				
FnB:												
Parnell-----	C/D	None-----	---	---	+1-0.5	Apparent	Jan-Dec	>60	---	High-----	High-----	Low.
FoB:												
Forman-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Buse-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Low-----	Low.
Aastad-----	B	None-----	---	---	2.5-4.0	Apparent	Oct-Jun	>60	---	High-----	High-----	Moderate.
FoC:												
Forman-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Buse-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Low-----	Low.
Aastad-----	B	None-----	---	---	2.5-4.0	Apparent	Mar-Jun	>60	---	Moderate	High-----	Low.
FpB, FpC:												
Forman-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Buse-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Low-----	Low.
Parnell-----	C/D	None-----	---	---	+1-0.5	Apparent	Jan-Dec	>60	---	High-----	High-----	Low.
Gb:												
Great Bend	B	None-----	---	---	>6.0	---	---	>60	---	High-----	High-----	Moderate.
Gp:												
Great Bend-----	B	None-----	---	---	>6.0	---	---	>60	---	High-----	High-----	Moderate.
Putney-----	B	None-----	---	---	>6.0	---	---	>60	---	High-----	High-----	High.
GzC:												
Great Bend-----	B	None-----	---	---	>6.0	---	---	>60	---	High-----	High-----	Moderate.
Zell-----	B	None-----	---	---	>6.0	---	---	>60	---	High-----	High-----	Moderate.
Huffton-----	B	None-----	---	---	>6.0	---	---	>60	---	High-----	High-----	Moderate.
HaA, HaB:												
Hamerly	C	None-----	---	---	1.5-3.5	Apparent	Apr-Jun	>60	---	High-----	High-----	Low.
Hb:												
Hamerly-----	C	None-----	---	---	1.5-3.5	Apparent	Apr-Jun	>60	---	High-----	High-----	Low.
Parnell-----	C/D	None-----	---	---	+1-0.5	Apparent	Jan-Dec	>60	---	High-----	High-----	Low.
Hd:												
Harmony-----	C	None-----	---	---	3.5-5.0	Apparent	Apr-Jun	>60	---	Moderate	High-----	Moderate.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth Ft	Kind	Months	Depth In	Hardness		Uncoated steel	Concrete
Hd: Aberdeen-----	C	None-----	---	---	3.5-5.0	Apparent	Apr-Jun	>60	---	Moderate	High-----	Moderate.
Hm: Harmony-----	C	None-----	---	---	3.5-5.0	Apparent	Apr-Jun	>60	---	Moderate	High-----	Moderate.
Beotia-----	B	None-----	---	---	>6.0	---	---	>60	---	High-----	High-----	Moderate.
Hr----- Harriet	D	Occasional	Long-----	Apr-Jun	0-1.0	Apparent	Sep-Jun	>60	---	High-----	High-----	Moderate.
HtA----- Hetland	C	None-----	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
HuB: Hetland-----	C	None-----	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Rusklyn-----	B	None-----	---	---	>6.0	---	---	>60	---	High-----	Moderate	Low.
KbE: Kloten-----	D	None-----	---	---	>6.0	---	---	9-20	Soft	Moderate	High-----	Low.
Buse-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Low-----	Low.
KrB: Kranzburg-----	B	None-----	---	---	>6.0	---	---	>80	---	High-----	High-----	Moderate.
Brookings-----	B	None-----	---	---	3.0-5.0	Perched	Oct-Jul	>60	---	High-----	High-----	Moderate.
Buse-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Low-----	Low.
Ks: Kranzburg-----	B	None-----	---	---	>6.0	---	---	>80	---	High-----	High-----	Moderate.
Brookings-----	B	None-----	---	---	3.0-5.0	Perched	Oct-Jul	>60	---	High-----	High-----	Moderate.
KtB: Kranzburg-----	B	None-----	---	---	>6.0	---	---	>80	---	High-----	High-----	Moderate.
Forman-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
La----- La Prairie	B	Rare-----	---	---	3.5-5.0	Apparent	Mar-Jun	>60	---	Moderate	Moderate	Low.
Lh: La Prairie-----	B	Occasional	Brief-----	Mar-Jun	3.5-5.0	Apparent	Mar-Jun	>60	---	Moderate	Moderate	Low.
Holmquist-----	D	Frequent---	Brief-----	Mar-Jun	0.5-1.5	Apparent	Oct-Jun	>60	---	Moderate	High-----	Moderate.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					<u>Ft</u>			<u>In</u>				
Lm----- Lamoure	C	Occasional	Brief----	Mar-Jun	1.0-2.0	Apparent	Oct-Jun	>60	---	High----	High----	Moderate.
Lo----- Lowe	B/D	Occasional	Brief----	Mar-Nov	0-1.5	Apparent	Jan-Dec	>60	---	High----	High----	Low.
Lu----- Ludden	D	Frequent----	Brief or long.	Mar-Jun	+5-1.5	Apparent	Mar-Jul	>60	---	High----	High----	Low.
Lw----- Ludden	D	Frequent----	Brief or long.	Mar-Jun	+2-1.0	Apparent	Nov-Jul	>60	---	High----	High----	Low.
Lx: Ludden-----	D	Frequent----	Brief or long.	Mar-Jun	+5-1.5	Apparent	Mar-Jul	>60	---	High----	High----	Low.
Ludden, saline---	D	Frequent----	Brief or long.	Mar-Jun	0-1.5	Apparent	Mar-Jul	>60	---	High----	High----	Moderate.
MaA, MaB, MaC: Maddock-----	A	None-----	---	---	>6.0	---	---	>60	---	Low-----	Moderate	Low.
Egeland-----	B	None-----	---	---	>6.0	---	---	>60	---	Low-----	Moderate	Low.
Md: Marysland-----	B/D	Occasional	Brief----	Apr-Sep	0.5-1.5	Apparent	Nov-Jul	>60	---	High----	High----	Low.
Divide-----	B	None-----	---	---	1.5-3.5	Apparent	Apr-Jun	>60	---	Moderate	High----	Low.
MfB, MgB----- Mauvais	C	None-----	---	---	1.0-3.5	Apparent	Apr-Mar	>60	---	High----	High----	Low.
MnA, MoB----- Minnewasta	D	None-----	---	---	1.0-3.5	Apparent	Nov-Jun	>60	---	High----	High----	Low.
Mw----- Minnewaukan	A/D	None-----	---	---	+5-1.5	Apparent	Mar-Jul	>60	---	Moderate	High----	Low.
Na: Nahon-----	D	None-----	---	---	3.5-5.0	Apparent	Apr-Jun	>60	---	Moderate	High----	Moderate.
Aberdeen-----	C	None-----	---	---	3.5-5.0	Apparent	Apr-Jun	>60	---	Moderate	High----	Moderate.
Exline-----	D	None-----	---	---	1.5-3.5	Apparent	Apr-Jun	>60	---	Moderate	High----	High.
NsB: Nutley-----	C	None-----	---	---	>6.0	---	---	>60	---	Moderate	High----	Low.
Sinai-----	C	None-----	---	---	>6.0	---	---	>60	---	Low-----	High----	High.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					<u>Ft</u>			<u>In</u>				
Oh----- Oldham	C/D	None-----	---	---	0.5-1.5	Apparent	Oct-Jun	>60	---	High-----	Moderate	High.
Or----- Orthents	A	None-----	---	---	>6.0	---	---	>60	---	Low-----	Moderate	Low.
Pa----- Parnell	C/D	None-----	---	---	+1-0.5	Apparent	Jan-Dec	>60	---	High-----	High-----	Low.
Pc----- Playmoor	C/D	Frequent----	Brief-----	Mar-Jun	0-1.5	Apparent	Sep-Jun	>60	---	High-----	High-----	High.
Pm: Playmoor-----	C/D	Frequent----	Brief-----	Mar-Jun	0-1.5	Apparent	Sep-Jun	>60	---	High-----	High-----	High.
Lamoure-----	C	Frequent----	Brief-----	Mar-Oct	0-1.5	Apparent	Oct-Jun	>60	---	High-----	High-----	Moderate.
PrC: Poinsett-----	B	None-----	---	---	>6.0	---	---	>60	---	High-----	High-----	Low.
Rusklyn-----	B	None-----	---	---	>6.0	---	---	>60	---	High-----	Moderate	Low.
PsB: Poinsett-----	B	None-----	---	---	>6.0	---	---	>60	---	High-----	High-----	Low.
Rusklyn-----	B	None-----	---	---	>6.0	---	---	>60	---	High-----	Moderate	Low.
Waubay-----	B	None-----	---	---	3.5-5.0	Apparent	Oct-Jun	>60	---	High-----	High-----	Low.
PwA, PwB: Poinsett-----	B	None-----	---	---	>6.0	---	---	>60	---	High-----	High-----	Low.
Waubay-----	B	None-----	---	---	3.5-5.0	Apparent	Oct-Jun	>60	---	High-----	High-----	Low.
Ra: Ranslo-----	D	Occasional	Very brief	Apr-Oct	1.0-3.0	Apparent	Apr-Jun	>60	---	High-----	High-----	Moderate.
Harriet-----	D	Occasional	Long-----	Apr-Jun	0-1.0	Apparent	Sep-Jun	>60	---	High-----	High-----	Moderate.
Rb----- Rauville	D	Frequent----	Long-----	Mar-Oct	0-0.5	Apparent	Jan-Dec	>60	---	High-----	High-----	Moderate.
RfA, RfB: Renshaw-----	B	None-----	---	---	>6.0	---	---	>60	---	Low-----	Moderate	Low.
Fordville-----	B	None-----	---	---	>6.0	---	---	>60	---	Low-----	Moderate	Low.
RSA, RSB: Renshaw-----	B	None-----	---	---	>6.0	---	---	>60	---	Low-----	Moderate	Low.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth Ft	Kind	Months	Depth In	Hardness		Uncoated steel	Concrete
RsA, RsB: Sioux-----	A	None-----	---	---	>6.0	---	---	>60	---	Low-----	Low-----	Low.
Ru: Ryan-----	D	Occasional	Brief or long.	Mar-Jun	+5-1.5	Apparent	Mar-Jul	>60	---	Moderate	High-----	Moderate.
Ludden-----	D	Frequent----	Brief or long.	Mar-Jun	+5-1.5	Apparent	Mar-Jul	>60	---	High-----	High-----	Low.
SaA: Sinai-----	C	None-----	---	---	>6.0	---	---	>60	---	Low-----	High-----	High.
Nutley-----	C	None-----	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
SbB, SoB: Sioux-----	A	None-----	---	---	>6.0	---	---	>60	---	Low-----	Low-----	Low.
SrD, SrE, SsE: Sioux-----	A	None-----	---	---	>6.0	---	---	>60	---	Low-----	Low-----	Low.
Renshaw-----	B	None-----	---	---	>6.0	---	---	>60	---	Low-----	Moderate	Low.
Sw----- Southam	D	None-----	---	---	+5-1.0	Apparent	Jan-Dec	>60	---	High-----	High-----	Low.
To----- Tonka	C/D	None-----	---	---	+5-1.0	Apparent	Apr-Jun	>60	---	High-----	High-----	Low.
Va----- Vallers	C	Rare-----	---	---	0.5-1.5	Apparent	Apr-Jul	>60	---	High-----	High-----	Moderate.
Vh: Vallers-----	C	Rare-----	---	---	0.5-1.5	Apparent	Apr-Jun	>80	---	High-----	High-----	Low.
Hamerly-----	C	None-----	---	---	1.5-3.5	Apparent	Apr-Jun	>60	---	High-----	High-----	Low.
VoA, VoB: Vienna-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Brookings-----	B	None-----	---	---	3.0-5.0	Perched	Oct-Jul	>60	---	High-----	High-----	Moderate.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Aastad-----	Fine-loamy, mixed Pachic Udic Haploborolls
Aberdeen-----	Fine, montmorillonitic Glossic Udic Natriborolls
Aquents-----	Aquents
Arvilla-----	Sandy, mixed Udic Haploborolls
Badger-----	Fine, montmorillonitic, frigid Typic Argiaquolls
Barnes-----	Fine-loamy, mixed Udic Haploborolls
Bearden-----	Fine-silty, frigid Aeric Calciaquolls
Beotia-----	Fine-silty, mixed Pachic Udic Haploborolls
Brookings-----	Fine-silty, mixed Pachic Udic Haploborolls
Buse-----	Fine-loamy, mixed Udic Calciborolls
Cavour-----	Fine, montmorillonitic Udic Natriborolls
Colvin-----	Fine-silty, frigid Typic Calciaquolls
Cresbard-----	Fine, montmorillonitic Glossic Udic Natriborolls
Cubden-----	Fine-silty, frigid Aeric Calciaquolls
Divide-----	Fine-loamy over sandy or sandy-skeletal, frigid Aeric Calciaquolls
Dovray-----	Fine, montmorillonitic, frigid Cumulic Vertic Epiquolls
Eckman-----	Coarse-silty, mixed Udic Haploborolls
Edgeley-----	Fine-loamy, mixed Udic Haploborolls
Egeland-----	Coarse-loamy, mixed Udic Haploborolls
Embsen-----	Coarse-loamy, mixed Pachic Udic Haploborolls
Exline-----	Fine, montmorillonitic Leptic Natriborolls
Ferney-----	Fine, montmorillonitic Leptic Natriborolls
Fordville-----	Fine-loamy over sandy or sandy-skeletal, mixed Pachic Udic Haploborolls
Forman-----	Fine-loamy, mixed Udic Argiborolls
Gardena-----	Coarse-silty, mixed Pachic Udic Haploborolls
Great Bend-----	Fine-silty, mixed Udic Haploborolls
Hamerly-----	Fine-loamy, frigid Aeric Calciaquolls
Harmony-----	Fine, montmorillonitic Pachic Udic Argiborolls
Harriet-----	Fine, montmorillonitic, frigid Typic Natraquolls
Hetland-----	Fine, montmorillonitic Vertic Argiborolls
Holmquist-----	Coarse-loamy, mixed (calcareous), frigid Mollic Fluvaquents
Huffton-----	Coarse-silty, mixed Udic Calciborolls
Kloten-----	Loamy, mixed, shallow Udorthentic Haploborolls
Kranzburg-----	Fine-silty, mixed Udic Haploborolls
La Prairie-----	Fine-loamy, mixed Cumulic Udic Haploborolls
Lamoure-----	Fine-silty, mixed (calcareous), frigid Cumulic Endoaquolls
Langhei-----	Fine-loamy, mixed, frigid Typic Eutrochrepts
Lowe-----	Fine-loamy, frigid Typic Calciaquolls
Ludden-----	Fine, montmorillonitic, frigid Typic Endoaquerts
Ludden, saline-----	Fine, montmorillonitic, frigid Typic Endoaquerts
Maddock-----	Sandy, mixed Udorthentic Haploborolls
Marysland-----	Fine-loamy over sandy or sandy-skeletal, frigid Typic Calciaquolls
Mauvais-----	Fine-loamy, mixed (calcareous), frigid Aeric Endoaquents
Minnewasta-----	Sandy over loamy, mixed (calcareous), frigid Aeric Haplaquents
Minnewaukan-----	Mixed, frigid Typic Psammaquents
Nahon-----	Fine, montmorillonitic Udic Natriborolls
Nutley-----	Fine, montmorillonitic, frigid Chromic Hapluderts
Oldham-----	Fine, montmorillonitic (calcareous), frigid Cumulic Vertic Epiquolls
Orthents-----	Orthents
Parnell-----	Fine, montmorillonitic, frigid Vertic Argiaquolls
Playmoor-----	Fine-silty, mixed (calcareous), frigid Cumulic Haplaquolls
Poinsett-----	Fine-silty, mixed Udic Haploborolls
Putney-----	Fine-silty, mixed Udic Haploborolls
Ranslo-----	Fine, montmorillonitic, frigid Typic Natraquolls
Rauville-----	Fine-silty, mixed (calcareous), frigid Cumulic Endoaquolls
Renshaw-----	Fine-loamy over sandy or sandy-skeletal, mixed Udic Haploborolls
Rondell-----	Fine-silty, mixed Aquic Calciborolls
Rusklyn-----	Fine-silty, mixed Udic Calciborolls
Ryan-----	Fine, montmorillonitic, frigid Typic Natraquerts
Sinai-----	Fine, montmorillonitic, frigid Typic Hapluderts
Sioux-----	Sandy-skeletal, mixed Udorthentic Haploborolls

TABLE 18.--CLASSIFICATION OF THE SOILS--Continued

Soil name	Family or higher taxonomic class
Southam-----	Fine, montmorillonitic (calcareous), frigid Cumulic Vertic Endoaquolls
Tonka-----	Fine, montmorillonitic, frigid Argilaquic Argialbolls
Vallers-----	Fine-loamy, frigid Typic Calciquolls
Vienna-----	Fine-loamy, mixed Udic Haploborolls
Waubay-----	Fine-silty, mixed Pachic Udic Haploborolls
Zell-----	Coarse-silty, mixed Udic Calciborolls

Interpretive Groups

INTERPRETIVE GROUPS

Map symbol	Soil name	Technical Guide area	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
Aa	Aastad-----	Eastern	I-3	Loamy Overflow----	1	K
An	Aberdeen-----	East Central	IIIs-1	Clayey-----	4	E
	Nahon-----	East Central	IVs-2	Claypan-----	9	C
Aq	Aquents-----	Eastern	VIIIs-1	Not assigned-----	10	NS
ArB	Arvilla-----	Eastern	IVs-2	Shallow to Gravel--	6	D2
Ba	Bearden-----	East Central	IIE-4	Limy Subirrigated--	1	F
BA	Bearden-----	East Central	IIE-4	Limy Subirrigated--	1	F
	Huffton-----	East Central	IVe-2	Thin Upland-----	8	G
BbA	Beotia-----	East Central	IIC-3	Silty-----	3	K
Bc	Beotia-----	East Central	IIC-3	Silty-----	3	K
	Rondell-----	East Central	IIE-4	Limy Subirrigated--	8	F
BnD	Buse-----	Eastern	VIe-3	Thin Upland-----	8	G
	Barnes-----	Eastern	IVe-1	Silty-----	3	F
BoE	Buse-----	Eastern	VIIIs-1	Thin Upland-----	10	NS
	Barnes-----	Eastern	VIIIs-1	Silty-----	10	NS
BpE	Buse-----	Eastern	VIIIs-1	Thin Upland-----	10	NS
	Barnes-----	Eastern	VIIIs-1	Silty-----	10	NS
	Parnell-----	Eastern	Vw-2	Shallow Marsh-----	10	B2
BrE	Buse-----	Eastern	VIIe-1	Thin Upland-----	10	NS
	Langhei-----	Eastern	VIIe-1	Thin Upland-----	10	NS
BsE	Buse-----	Eastern	VIIe-1	Thin Upland-----	10	NS
	La Prairie-----	Eastern	VIw-1	Loamy Overflow----	1	NS
	Barnes-----	Eastern	VIe-1	Silty-----	10	NS
BxE	Buse-----	Eastern	VIIe-1	Thin Upland-----	10	NS
	Sioux-----	Eastern	VIIIs-2	Very Shallow-----	10	NS
Ca	Cavour-----	East Central	IVs-2	Claypan-----	9	C
	Ferney-----	East Central	VIIs-1	Thin Claypan-----	10	NS
Cn	Colvin-----	Eastern	IVw-3	Subirrigated-----	10	A
Cr	Cresbard-----	East Central	IIIs-1	Clayey-----	4	E
	Cavour-----	East Central	IVs-2	Claypan-----	9	C
Cu	Cubden-----	Eastern	IIs-4	Limy Subirrigated--	1	F

INTERPRETIVE GROUPS--Continued

Map symbol	Soil name	Technical Guide area	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
Cw	Cubden-----	Eastern	IIs-4	Limy Subirrigated--	1	F
	Badger-----	Eastern	IIw-1	Loamy Overflow----	2	A
Cx	Cubden-----	East Central	IIE-4	Limy Subirrigated--	1	F
	Tonka-----	East Central	IVw-1	Wet Meadow-----	10	B2
Dd	Divide-----	Eastern	IIIs-4	Limy Subirrigated--	1	D1
Do	Dovray-----	East Central	Vw-4	Wetland-----	10	B2
EaA	Eckman-----	East Central	IIE-6	Silty-----	3	F
EhB	Eckman-----	East Central	IIE-1	Silty-----	3	F
	Gardena-----	East Central	IIE-6	Silty-----	1	K
EcB	Eckman-----	East Central	IIE-1	Silty-----	3	F
	Zell-----	East Central	IVe-2	Thin Upland-----	8	G
EdC	Edgeley-----	East Central	IIIE-1	Silty-----	6	F
EgB	Egeland-----	Eastern	IIIE-7	Sandy-----	5	H
	Embsen-----	Eastern	IIIE-7	Sandy-----	1	H
En	Exline-----	East Central	VIIs-1	Thin Claypan-----	10	NS
	Aberdeen-----	East Central	IIIs-1	Clayey-----	4	E
	Nahon-----	East Central	IVs-2	Claypan-----	9	C
Ep	Exline-----	East Central	VIIs-1	Thin Claypan-----	10	NS
	Putney-----	East Central	IIE-5	Silty-----	3	F
Fd	Fordville-----	Eastern	IIs-3	Silty-----	6	D1
FmA	Forman-----	Eastern	I-2	Silty-----	3	F
	Aastad-----	Eastern	I-3	Loamy Overflow----	1	K
FmB	Forman-----	Eastern	IIE-2	Silty-----	3	F
	Aastad-----	Eastern	I-3	Loamy Overflow----	1	K
FnB	Forman-----	Eastern	IIE-2	Silty-----	3	F
	Aastad-----	Eastern	I-3	Loamy Overflow----	1	K
	Parnell-----	Eastern	Vw-2	Shallow Marsh-----	10	B2
FoB	Forman-----	Eastern	IIE-2	Silty-----	3	F
	Buse-----	Eastern	IIIE-6	Thin Upland-----	8	G
	Aastad-----	Eastern	I-3	Loamy Overflow----	1	K
FoC	Forman-----	Eastern	IIIE-1	Silty-----	3	F
	Buse-----	Eastern	IVe-2	Thin Upland-----	8	G
	Aastad-----	Eastern	IIE-1	Silty-----	1	F

INTERPRETIVE GROUPS--Continued

Map symbol	Soil name	Technical Guide area	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
FpB	Forman-----	Eastern	IIE-2	Silty-----	3	F
	Buse-----	Eastern	IIIE-6	Thin Upland-----	8	G
	Parnell-----	Eastern	Vw-2	Shallow Marsh-----	10	B2
FpC	Forman-----	Eastern	IIIE-1	Silty-----	3	F
	Buse-----	Eastern	IVE-2	Thin Upland-----	8	G
	Parnell-----	Eastern	Vw-2	Shallow Marsh-----	10	B2
Gb	Great Bend-----	East Central	IIC-2	Silty-----	3	F
Gp	Great Bend-----	East Central	IIC-2	Silty-----	3	F
	Putney-----	East Central	IIS-3	Silty-----	3	F
GzC	Great Bend-----	East Central	IIIE-1	Silty-----	3	F
	Zell-----	East Central	IVE-3	Thin Upland-----	8	G
	Huffton-----	East Central	IVE-3	Thin Upland-----	8	G
HaA	Hamerly-----	Eastern	IIS-4	Limy Subirrigated--	1	F
HaB	Hamerly-----	Eastern	IIIE-8	Limy Subirrigated--	1	F
Hb	Hamerly-----	Eastern	IIS-4	Limy Subirrigated--	1	F
	Parnell-----	Eastern	Vw-2	Shallow Marsh-----	10	B2
Hd	Harmony-----	East Central	IIS-1	Clayey-----	4	E
	Aberdeen-----	East Central	IIIS-1	Clayey-----	4	E
Hm	Harmony-----	East Central	IIS-1	Clayey-----	4	E
	Beotia-----	East Central	IIC-3	Silty-----	3	K
Hr	Harriet-----	East Central	VIS-6	Saline Lowland-----	10	J
HtA	Hetland-----	Eastern	I-2	Silty-----	4	F
HuB	Hetland-----	Eastern	IIE-3	Silty-----	4	F
	Rusklyn-----	Eastern	IIIE-6	Thin Upland-----	8	G
KbE	Kloten-----	East Central	VIIIE-3	Shallow-----	10	NS
	Buse-----	East Central	VIIIE-3	Thin Upland-----	10	NS
KrB	Kranzburg-----	East Central	IIE-1	Silty-----	3	F
	Brookings-----	East Central	IIC-3	Loamy Overflow-----	1	K
	Buse-----	East Central	IIIE-12	Thin Upland-----	8	G
Ks	Kranzburg-----	East Central	IIC-2	Silty-----	3	F
	Brookings-----	East Central	IIC-3	Loamy Overflow-----	1	K

INTERPRETIVE GROUPS--Continued

Map symbol	Soil name	Technical Guide area	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
KtB	Kranzburg-----	Eastern	IIe-3	Silty-----	3	F
	Forman-----	Eastern	IIe-2	Silty-----	3	F
La	La Prairie-----	East Central	IIC-1	Silty-----	1	K
Lh	La Prairie-----	East Central	VIw-1	Loamy Overflow----	1	NS
	Holmquist-----	East Central	VIw-1	Saline Subirrigated	10	NS
Lm	Lamoure-----	East Central	IIw-2	Subirrigated-----	2	A
Lo	Lowe-----	East Central	IVw-3	Subirrigated-----	10	A
Lu	Ludden-----	East Central	IVw-1	Wetland-----	10	B1
Lw	Ludden-----	East Central	VIIIw-1	Not assigned-----	10	NS
Lx	Ludden-----	East Central	IVw-1	Wetland-----	10	B1
	Ludden, saline----	East Central	IVw-5	Saline Lowland-----	10	J
MaA	Maddock-----	Eastern	IIIs-1	Sandy-----	5	H
	Egeland-----	Eastern	IIIs-1	Sandy-----	5	H
MaB	Maddock-----	Eastern	IIIE-7	Sandy-----	5	H
	Egeland-----	Eastern	IIIE-7	Sandy-----	5	H
MaC	Maddock-----	Eastern	IVe-3	Sandy-----	5	H
	Egeland-----	Eastern	IVe-3	Sandy-----	5	H
Md	Marysland-----	Eastern	IVw-3	Subirrigated-----	10	B1
	Divide-----	Eastern	IIIs-4	Limy Subirrigated--	1	D1
MfB	Mauvais-----	Eastern	IVw-3	Subirrigated-----	10	A
MgB	Mauvais-----	Eastern	VIIIs-1	Subirrigated-----	10	NS
MnA	Minnewasta-----	Eastern	IVw-1	Subirrigated-----	10	A
MoB	Minnewasta-----	Eastern	VIIIs-1	Subirrigated-----	10	NS
Mw	Minnewaukan-----	Eastern	IVw-1	Subirrigated-----	2	A
Na	Nahon-----	East Central	IVs-2	Claypan-----	9	C
	Aberdeen-----	East Central	IIIs-1	Clayey-----	4	E
	Exline-----	East Central	VIIs-1	Thin Claypan-----	10	NS
NsB	Nutley-----	Eastern	IIIE-3	Clayey-----	4	I
	Sinai-----	Eastern	IIIE-3	Clayey-----	4	I
Oh	Oldham-----	Eastern	Vw-2	Wetland-----	10	B2
Or	Orthents-----	Eastern	VIIIIs-1	Very Shallow-----	10	NS
Pa	Parnell-----	Eastern	Vw-2	Shallow Marsh-----	10	B2
Pc	Playmoor-----	East Central	IVw-4	Saline Subirrigated	10	J

INTERPRETIVE GROUPS--Continued

Map symbol	Soil name	Technical Guide area	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
Pm	Playmoor-----	East Central	VIw-1	Saline Subirrigated	10	NS
	Lamoure-----	East Central	VIw-1	Subirrigated-----	2	NS
PrC	Poinsett-----	Eastern	IIIE-2	Silty-----	3	F
	Rusklyn-----	Eastern	IVe-2	Thin Upland-----	8	G
PsB	Poinsett-----	Eastern	IIE-3	Silty-----	3	F
	Rusklyn-----	Eastern	IIIE-6	Thin Upland-----	8	G
	Waubay-----	Eastern	I-3	Loamy Overflow-----	1	K
PwA	Poinsett-----	Eastern	I-2	Silty-----	3	F
	Waubay-----	Eastern	I-3	Loamy Overflow-----	1	K
PwB	Poinsett-----	Eastern	IIE-3	Silty-----	3	F
	Waubay-----	Eastern	I-3	Loamy Overflow-----	1	K
Ra	Ranslo-----	East Central	IVs-2	Subirrigated-----	9	C
	Harriet-----	East Central	VIIs-6	Saline Lowland-----	10	J
Rb	Rauville-----	Eastern	Vw-1	Wetland-----	10	B1
RfA	Renshaw-----	Eastern	IIIs-3	Shallow to Gravel--	6	D2
	Fordville-----	Eastern	IIs-3	Silty-----	6	D1
RfB	Renshaw-----	Eastern	IVs-2	Shallow to Gravel--	6	D2
	Fordville-----	Eastern	IIE-5	Silty-----	6	D1
RsA	Renshaw-----	Eastern	IIIs-3	Shallow to Gravel--	6	D2
	Sioux-----	Eastern	VIIs-3	Very Shallow-----	10	NS
RsB	Renshaw-----	Eastern	IVs-2	Shallow to Gravel--	6	D2
	Sioux-----	Eastern	VIIs-3	Very Shallow-----	10	NS
Ru	Ryan-----	East Central	VIIs-6	Thin Claypan-----	10	NS
	Ludden-----	East Central	IVw-1	Wetland-----	10	B1
SaA	Sinai-----	Eastern	IIs-2	Clayey-----	4	I
	Nutley-----	Eastern	IIs-2	Clayey-----	4	I
SbB	Sioux-----	Eastern	VIIs-3	Very Shallow-----	10	NS
SoB	Sioux-----	Eastern	VIIIs-1	Very Shallow-----	10	NS
SrD	Sioux-----	Eastern	VIIs-3	Very Shallow-----	10	NS
	Renshaw-----	Eastern	VIe-6	Shallow to Gravel--	10	NS
SrE	Sioux-----	Eastern	VIIIs-2	Very Shallow-----	10	NS
	Renshaw-----	Eastern	VIe-6	Shallow to Gravel--	10	NS

INTERPRETIVE GROUPS--Continued

Map symbol	Soil name	Technical Guide area	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
SsE	Sioux-----	Eastern	VIIIs-1	Very Shallow-----	10	NS
	Renshaw-----	Eastern	VIIIs-1	Shallow to Gravel--	10	NS
Sw	Southam-----	Eastern	VIIIw-1	Not assigned-----	10	NS
To	Tonka-----	East Central	IVw-1	Wet Meadow-----	10	B2
Va	Vallars-----	East Central	IVw-4	Saline Subirrigated	10	J
Vh	Vallars-----	Eastern	IVw-3	Subirrigated-----	10	A
	Hamerly-----	Eastern	IIs-4	Limy Subirrigated--	1	F
VoA	Vienna-----	Eastern	I-2	Silty-----	3	F
	Brookings-----	Eastern	I-3	Loamy Overflow----	1	K
VoB	Vienna-----	Eastern	IIs-2	Silty-----	3	F
	Brookings-----	Eastern	I-3	Loamy Overflow----	1	K

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